APPENDIX A

PRELIMINARY GROUNDWATER QUALITY INVESTIGATION FOR CHEMCLENE CORPORATION MALVERN, PENNSYLVANIA

Initial Summary of Data and Clean-Up Options (March 1982)

PRELIMINARY
GROUNDWATER QUALITY INVESTIGATION
FOR
CHEMCLENE CORPORATION
MALVERN, PENNSYLVANIA

Initial Summary of Data
and
Clean-up Options

March 1982

Prepared for the

CHEMCLENE CORPORATION
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Prepared by

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INTRODUCTION

Background

Chemclene Corporation sells and recycles industrial cleaning solvents. For over 30 years, they have maintained a successful and innovative recycling facility at their present location in Malvern, Pennsylvania. The Chemclene Corporation sells and reclaims industrial cleaning solvents including trichloroethylene (TCE), 1,1,1-trichloroethane, perchloroethylene (PCE) also called tetrachloroethylene and methylene chloride. These solvents are used by their many industrial customers throughout the Delaware Valley for degreasing and other cleaning purposes. Without Chemclene's recycling service, many customers would have probably dumped or discarded spent solvent wherever it was most convenient. Chemclene employs a distillation process that results in (1) the removal of impurities from a particular solvent so that it can be returned to a customer for reuse and (2) the formation of small to moderate quantities of sludge which is sent via a licensed transporter to an approved disposal facility.

During the spring of 1980 when several incidents of TCE contaminated ground water were discovered in Montgomery and Chester Counties, the Chemclene Corporation voluntarily began sampling selected private wells in the immediate vicinity of their property. The sampling of area wells was undertaken

as a precautionary measure. When some of the wells sampled were found to contain TCE levels greater than 4.5 ppb, appropriate officials with the Pennsylvania Department of Environmental Resources (DER) in Norristown were notified. 4.5 ppb was used as a lower limit to conform with DER's policy at the time regarding public water supplies. 4.5 ppb is also near the detectability limits of most analytical equipment. As a result of Chemclene Corporation's initial findings, they immediately began taking steps to investigate, define and rectify any potential contamination problem emanating from their property. These steps included:

1. Sampling nearby wells to determine if any chlorinated hydrocarbons were present.
2. Engaging the services of Moorshead-Siddiqui and Associates, groundwater geologists, to assist in the investigation of the problem.
3. Meeting with DER officials on-site and in Norristown to discuss the problem and to develop solutions.
4. Installing carbon filters on all household systems where levels of TCE were above 4.5 ppb.
5. Reviewing material handling procedures and facilities in their plant to provide assurance that no activity would cause soil or groundwater contamination.
6. Beginning to remove drums deposited in a former disposal area.

As a result of Moorshead-Siddiqui and Associates initial investigation, it was determined that at least two areas on the Chemclene Corporation property were potential sources of groundwater contamination. These areas included the plant area on the east side of the property and a former disposal area on the west side of the property (see Figure 1).

Site Locations

Chemclene Corporation is located on over 100 acres of

LOCATION MAPS
FIGURE 1

Project: Chemclene

Well Chemclene Project

State: Pennsylvania

Portion of USGS Quad: Malvern 7½

County: Chester

~~Town~~/Township: East Whiteland

Street: Phoenixville Pike

Tract: —

Topographic setting: valley + side hill

Physiographic province: Piedmont

Geologic formation: see text

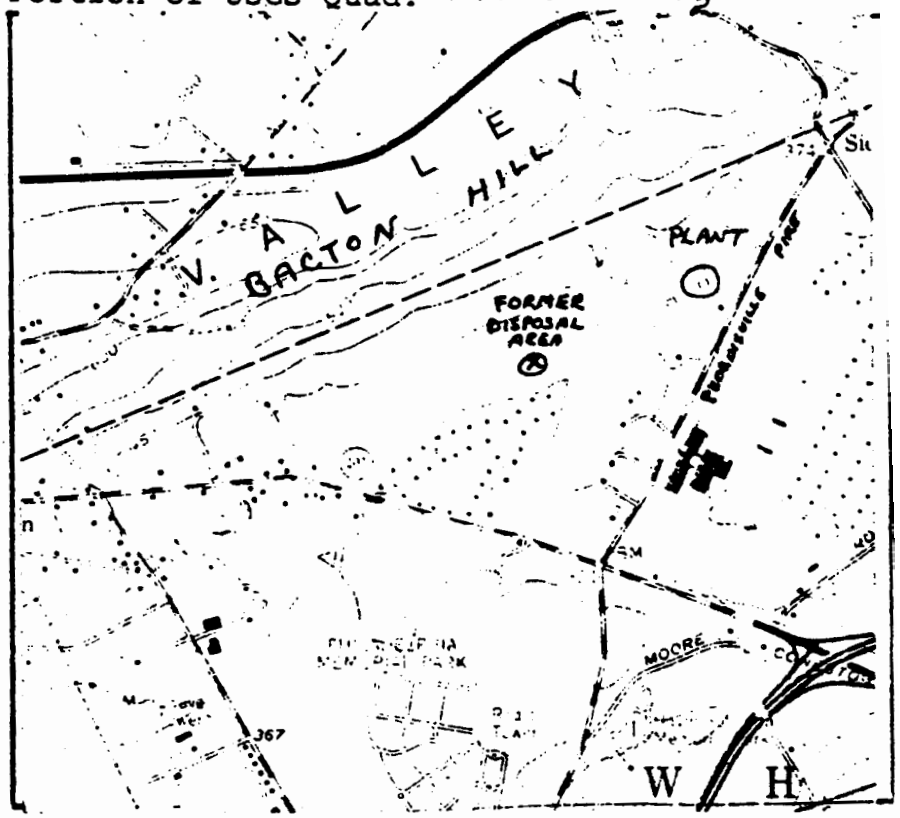
Longitude: -

Latitude: -

Elevation at surface: 300'-400'

Flood elevation: none

Flood potential: none



Date:

Scale: 1=2000'
Contour Int: 10'

Locations also plotted:

SITE PLAN

Access problems:

none

see airphotos and 1" = 400' line drawings.

Site plan prepared by:
T. Moorehead

Identified on plot plan:

- ✓ wells
- ✓ springs
- ✓ pipelines
- ✓ surface water bodies
- ✓ roads
- property l'ns
- electric l'ns

Site/Well identified by:

casing

Completed by: T. Moorehead
Date: 9/81

Date:

Scale:

mostly wooded property situated on the southeast slope of Bacton Hill in East Whiteland Township, Chester County, Pennsylvania (see Figure 1). As Figure 1 indicates, the plant area and the former disposal area are situated approximately 2,500 feet apart along the base of Bacton Hill. Access to the former disposal area is along an abandoned railroad right-of-way which crosses Phoenixville Pike near the entrance drive leading to the Chemclene plant. Parallel and to the north of the railroad right-of-way is the right-of-way of the Transcontinental Gas Pipe Line. During the construction of the gas pipe line in 1951 or 1952, an excavation was made at what is now called the former disposal area. Slowly that excavation was filled with rusted and unuseable drums, discarded equipment, domestic trash and excavated soil.

The area surrounding the Chemclene Corporation property has gradually changed over the past 30 years from open farmland and woods to one-acre, single family residential developments and industrial parks. Homes south and west of the property were generally built between 1956 and 1959; with additional developments to the north and east of the Chemclene plant being built during the mid 1970's.

Scope of the Present Investigation

In order to delineate the extent of present contamination, prevent future contamination and develop remedial measures,

the following work plan was developed by Moorshead-Siddiqui and Associates and approved by DER:

1. Select monitoring well locations based on: a fracture trace analysis, the possible location of contamination sources, projected flow directions and the suitability of access for a drilling rig. Both 6" steel cased and 1¼" pvc wells will be constructed. Sites will be staked in the field and checked by a DER hydrogeologist prior to drilling.
2. Obtain soil samples and construct monitoring wells at designated locations. Mechanical rather than solvent-cement joints will be used to fasten screens to pvc pipe. All monitoring wells will be thoroughly developed to insure that representative water samples are collected.
3. Determine measuring point elevations on new monitor wells so that an existing water level contour map can be expanded to cover the former disposal area and the plant area.
4. Determine the extent of soil contamination and ascertain clean-up procedures.
5. Test pump and sample all monitoring wells paying close attention to the cones of influence around each well and the potential yield of the 6-inch diameter wells since they might be used for removal purposes.
6. Measure water levels and sample specific neighboring wells to determine long-term trends in flow directions and groundwater quality.
7. Assess the extent of the overall contamination problem and review possible alternative solutions with DER staff.
8. If possible, implement selected abatement techniques on a trial basis to determine their feasibility and cost.
9. Analyze all data and information to develop a proposed abatement plan. Present the proposed plan to DER for review and comments.
10. Prepare a final report containing all pertinent data and the agreed upon abatement plan.

Acknowledgements

Moorshead-Siddiqui and Associates would like to extend its appreciation to all the homeowners in the area for

their cooperation in providing water samples and for providing whatever data was available concerning their particular well. We would likewise wish to thank those homeowners with accessible wells who allowed us to measure water levels on various occasions.

Appreciation is also extended to the Philadelphia Suburban Water Company who at no cost provided a survey crew to determine the exact elevations of wells and monitoring points constructed in the area since 1978.

SITE CONDITIONS

Topography and Surface Drainage

As indicated on Figure 1, the plant area and the former disposal area are both situated at the base of Bacton Hill. Based on U.S.G.S. data, surface elevations at both sites are between 275 to 365 feet above MSL. Surface drainage in both areas is toward the southwest. A surface water divide exists slightly to the northeast of the Chemclene plant and surface drainage over the divide is down a streamless swale leading to the Devault and Cedar Hollow areas. The topography of the area is controlled for the most part by the composition of and structure in the underlying bedrock. Less easily weathered and eroded quartzites are found under Bacton Hill and more easily weathered and eroded carbonate rocks are found beneath the valley at the foot of Bacton Hill.

Geology

The geology of the area, obtained from published

geologic maps, has been superimposed on the base map used during the present investigation (see Figure 2). As the map indicates, the study area is underlain by the dolomites and limestones of the Elbrook, Ledger, Kinzers and Vintage Formations and the schist and quartzite of the Harpers and Chickies Formations. The former disposal area is underlain by the Ledger Formation, a light gray dolomite, which covers much of the study area. The plant area is underlain by the Elbrook Formation, a light gray to yellowish, siliceous limestone containing interbedded dolomite. The hydrogeologic properties of both of these bedrock formations are very similar and for that reason Moorshead-Siddiqui and Associates has treated both of these formations as a single hydrogeologic unit for the purposes of this investigation.

The geologic map of the area indicates the presence of two major faults trending in a southwest-northeast direction across the area of the investigation. The northern-most of these two faults follows the break in slope at the base of Bacton Hill and serves as the boundary between the metamorphic phyllite and quartzites up slope and the carbonate rocks out in the valley. Major faulting and subsidiary fractures and joints have a significant impact on groundwater flow in the area.

Between the ground surface and underlying solid bedrock is a zone of weathered material called the overburden. The overburden thickness in the area varies from a few feet near bedrock exposures to probably depths of between 100

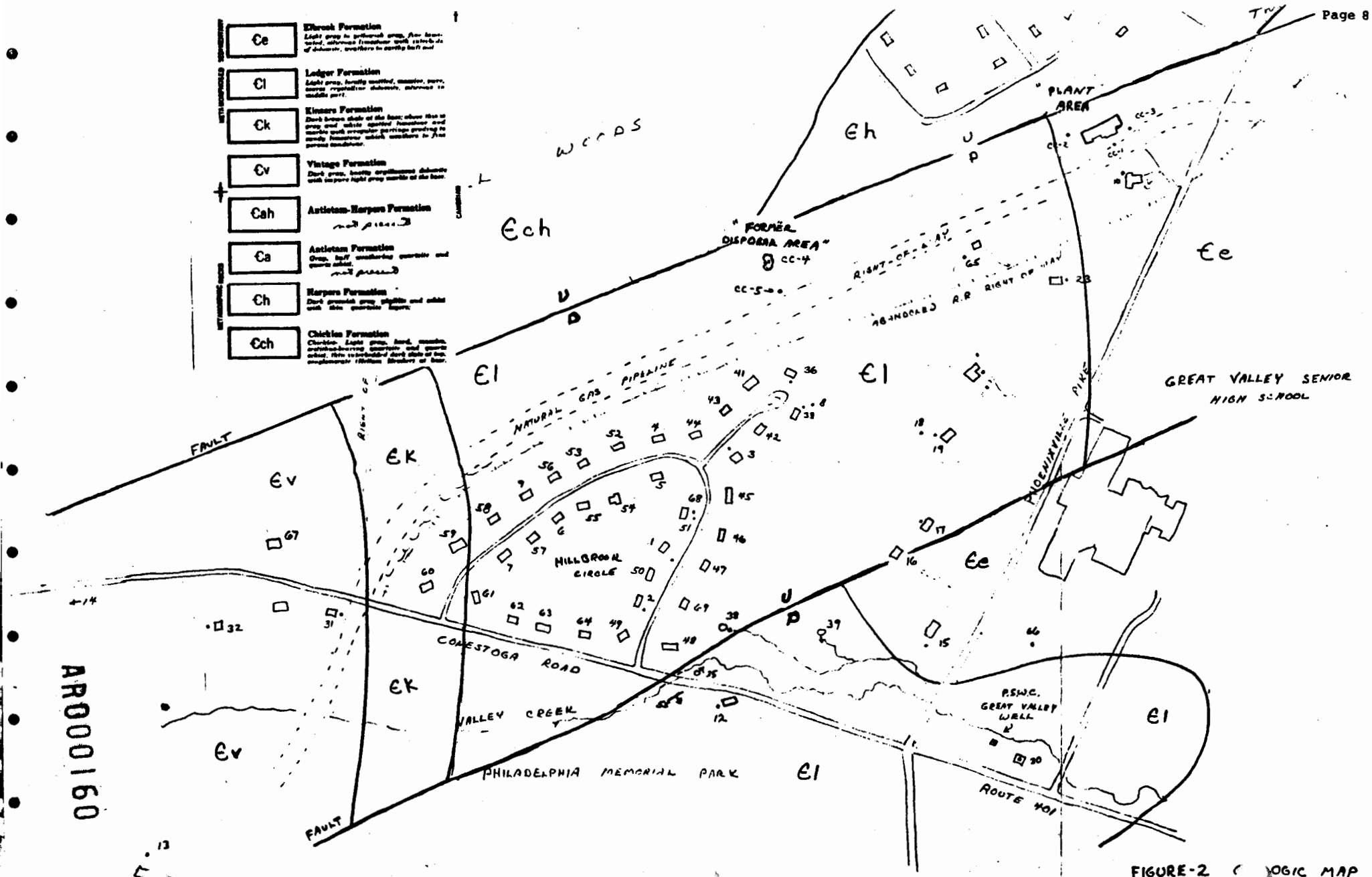


FIGURE-2 GEOLOGIC MAP

AR000160

and 150 feet at the centers of incipient sinkholes (in the carbonate rocks). Overburden materials consist mostly of clay and silt with some residual rock fragments and sand lenses.

Groundwater Flow

While topographic drainage patterns in the area would seem to indicate that all subsurface flow should drain towards the southeast and Valley Creek, water level data collected during a previous investigation (see References) and the present investigation indicate that such is probably not now the case. At one time groundwater flow was probably toward the southeast but increased pumping from a new quarry in the Devault area may have reversed flow directions.

Groundwater movement in the bedrock under much of the Chemclene property appears now to be toward the northeast, parallel to major faults. The groundwater discharge points (or sink) for this subsurface flow system are the deep quarries operated by the Martin-Marietta Corporation and the Warner Company in nearby Devault. Large amounts of ground water are pumped from these quarries for dewatering purposes and large cones of influence radiate away from them.

In addition to the influence which faulting and pumpage exercises on groundwater flow in the area, it is also probable that fracture zones and to a lesser degree bedding planes in the bedrock also influence groundwater flow. When rain or snowmelt enters the overburden (a process called infiltration), it moves vertically downward until the water-table is reached. The water-table is the

upper surface of the zone of saturation. The water-table may be either in the overburden or in the bedrock depending on a variety of complex hydrogeological inter-relationships and man-induced pumping. Depths to the water-table in the area vary between 0 feet at the surfaces of springs and some streams to more than 70 feet at other locations. Water levels fluctuate seasonally in response to groundwater recharge and groundwater discharge to streams and wells. Due to large, man-induced withdrawals from the area (quarries in Devault and the Philadelphia Suburban Water Company's Great Valley Well) and recent recharge deficiencies, water level depths are much greater than normal. Water level declines have caused some springs to dry up and some shallow wells to be adversely affected. During parts of the year, Valley Creek enters a sinkhole near where it crosses Route 401 and does not start flowing again until a point 200 yards below the Great Valley Well.

Groundwater Quality

Natural groundwater quality in the general vicinity of the Chemclene property would be classified as good to excellent. Ground water in the non-carbonate rocks will tend to be acidic and have low total solids. Ground water in the carbonate rocks will tend to have a higher pH and greater amounts of total dissolved solids. Ground water in the carbonate rocks will tend to be moderately to very hard and some homes in the area utilize water softeners for that reason.

An extensive amount of geochemical data has been collected by the Philadelphia Suburban Water Company since their Great Valley Well went into operation in 1977. This data to date indicates the presence of no unusual constituent (including chlorinated hydrocarbons) at any detectable concentration (personal communication with Richard Riegler, Philadelphia Suburban Water Company).

Groundwater Use In The Area

Most older homes in the area utilize on-site domestic wells. In the early 1970's, the Philadelphia Suburban Water Company began to extend public water service into the area. In 1977 the Philadelphia Suburban Water Company started to operate the high yielding Great Valley Production Well near the intersection of Route 401 and the Phoenixville Pike (see Figure 1). Homes, schools and businesses southeast and west of the Chemclene property toward Devault are presently provided with public water by Philadelphia Suburban Water Company. Since public water is available throughout much of the area, it is doubtful that many new wells will be drilled in the foreseeable future when new homes are built.

FIELD INVESTIGATION

Initial Sampling and Well Inventory

Many older homes south and southwest of the Chemclene property still use domestic on-site wells for water supply purposes. In order to collect necessary hydrogeological and water quality data, all wells in the vicinity of the

Chemclene property were inventoried by Moorshead-Siddiqui and Associates. The inventory consisted of an expansion of a previous inventory of wells undertaken in 1977 (see References). The inventory added homes where wells had been drilled or deepened between 1977 and the present. The locations of all wells in the vicinity of Chemclene's property are indicated on Figure 3 and available information concerning each well is found in Appendix A. During the well inventory, permission was obtained from residents with accessible wells to periodically measure water levels in their wells. As part of the inventory of wells, water samples were collected for chlorinated hydrocarbon analysis. A total of 44 samples were collected by Chemclene personnel on May 8 and 9, 1980, and on June 13, 1980. The samples were immediately taken to Cedar Grove Laboratories in Downingtown for analysis. The results of this analysis are found in Table 1 and represents data previously supplied to DER.

As a result of sampling, it was determined that a total of 11 wells had concentrations of TCE higher than 4.5 ppb. As a precautionary measure, all of these wells were immediately equipped with treatment devices despite a lack of evidence that any of them were directly contaminated by any activity on the Chemclene property.

Air Photo Analysis

Since groundwater flow patterns are controlled to a large extent by fractures and faults in the bedrock underlying the Chemclene Corporation property, an analysis of

air photos was made to delineate the location of such features. A technique known as fracture trace analysis has been used successfully many times by Moorshead-Siddiqui and Associates to locate high-yielding water wells; and it was felt that locating monitoring wells along fracture traces would help to increase the likelihood that a high yield would be obtained. Obtaining a high yield from the monitoring wells was though to be important for the following reasons:

1. The monitor wells had to be sampled with moderate capacity submersible pumps due to the anticipated depths to water.
2. Submersible pumps would also allow a relatively large volume of water to be pumped from each monitoring well thereby insuring that representative formational samples would be collected.
3. Certain monitoring well(s) could be converted to retrival wells (if necessary) in the future and a moderate to high yield would be advantageous for that purpose.
4. The well would provide water level data that was representative of the local flow system.

Stereo pairs of photographs taken in 1965, 1970 and 1975 by Aero Services, Inc. were used during the fracture trace analysis. A composite large scale (1" equals 400') photograph obtained from the Delaware Valley Regional Planning Commission (DRVPC) was used as a base map during the investigation. Most of the maps presented in this report were prepared from tracings from that composite photograph.

Test Drilling and Monitor Well Construction

As previously mentioned, there are two areas on the

Chemclene property where chlorinated hydrocarbons may have entered the groundwater flow system. These areas are in the vicinity of the plant and at the former disposal area. In order to gain additional information concerning subsurface conditions in the vicinity of both of these areas, it was decided to drill test holes and to construct monitoring wells. Test drilling and monitor well construction was designed to accomplish the following:

1. Obtain site specific geologic information including overburden thickness and bedrock lithology.
2. Determine subsurface permeability information.
3. Provide a means to measure water levels.
4. Provide a means to collect water samples for quality analysis.
5. Provide a retrival well, if necessary.

Test drilling and monitor well construction began October 15, 1980, and was finished on October 17, 1980. Thomas G. Keyes, Inc. completed the work under the supervision and an inspection of Moorshead-Siddiqui and Associates' personnel.

Since depths greater than 50 feet were anticipated and there was the probability of encountering large residual rock fragments in the overburden, an air rotary drilling rig was used. A hydrogeologist supervised drilling, collected well cuttings, described samples and made decisions concerning monitoring well construction. Each monitoring well was constructed based on information obtained in the field during test drilling. Monitor wells were constructed in such a way as to obtain a maximum amount of information while also

providing the flexibility of utilizing a monitoring well in the future, if necessary for contaminate retrival purposes.

Drilling in carbonate rock presents particularly difficult construction problems. To construct a typical water well, it may be necessary to install as much as 150 to 200 feet of casing in a hole to prevent caving and/or turbidity problems. Once casing is installed to these depths, there is no guarantee that any water will be obtained in the next 50 or 100 feet of drilling. For these reasons the drilling contractor was instructed to install a sufficient amount of casing to minimize the possibility of hole collapse, but not necessarily to prevent the occurrence of turbidity problems. Drilling was then to continue inside the casing to a depth five feet beyond the first water producing fracture or weathered zone. It was felt that constructing monitoring wells in this manner would minimize the likelihood of "casing off" badly contaminated water producing zones and would reduce the likelihood of having to drill to an extreme depth.

The locations of monitoring wells were selected in the down gradient directions of anticipated groundwater flow. Due to property boundary limitations behind the plant, it was not possible to provide an up gradient site. Their locations were checked and approved in the field prior to drilling by DER hydrogeologist, Marilyn Hewitt. The locations of all monitoring wells are indicated on Figure 3. More

exact locations are given in Figure 4 (for the plant area) and in Figure 5 (for the former disposal area). Details pertaining to each monitoring well, including a cross section of the materials penetrated and construction details are found in Appendix B.

Test drilling determined that the overburden on the Chemclene property was at least 50 feet thick and composed of materials with an uneven distribution both in size and lithology. Bedrock encountered during test drilling was for the most part slightly weathered to very weathered gray to buff limestone and dolomite.

Monitor well construction encountered many problems associated with attempting to complete wells in carbonate rock terrains. Monitor Well CC-1 collapsed several times during drilling. For this reason, it was decided to insert a 4" diameter pvc screen into the hole and stabilize it with a gravel pack. Attempts to insert the 4" screen and riser pipe beyond the bottom of the 6" casing in the well were unsuccessful. (It may be possible to use drilling mud and install a 2" diameter screen and gravel pack in Monitor Well CC-1, if it is decided to rehabilitate this well in the future.) The screen originally designated for CC-1 was then installed in Monitor Well CC-3 as a precaution against possible future collapse in that well.

In order to determine the relative interconnection between wells in the plant area, a sensitive water-level recorder was placed on CC-1 and CC-2 during the construction

LOCATION MAPS
FIGURE 4

Project: Chemclene Corp

Well Plant Area Chemclene Corp

State: Pennsylvania

County: Chester

City/Township: East Whiteland

Street:

Tract:

Topographic setting: valley

Physiographic province: Piedmont

Geologic formation: colluvium over carbonates

Longitude:

Latitude:

Elevation at surface: ~ 3 '

Flood elevation: none

Flood potential: none

Locations also plotted:

Access problems: none

Site plan prepared by:

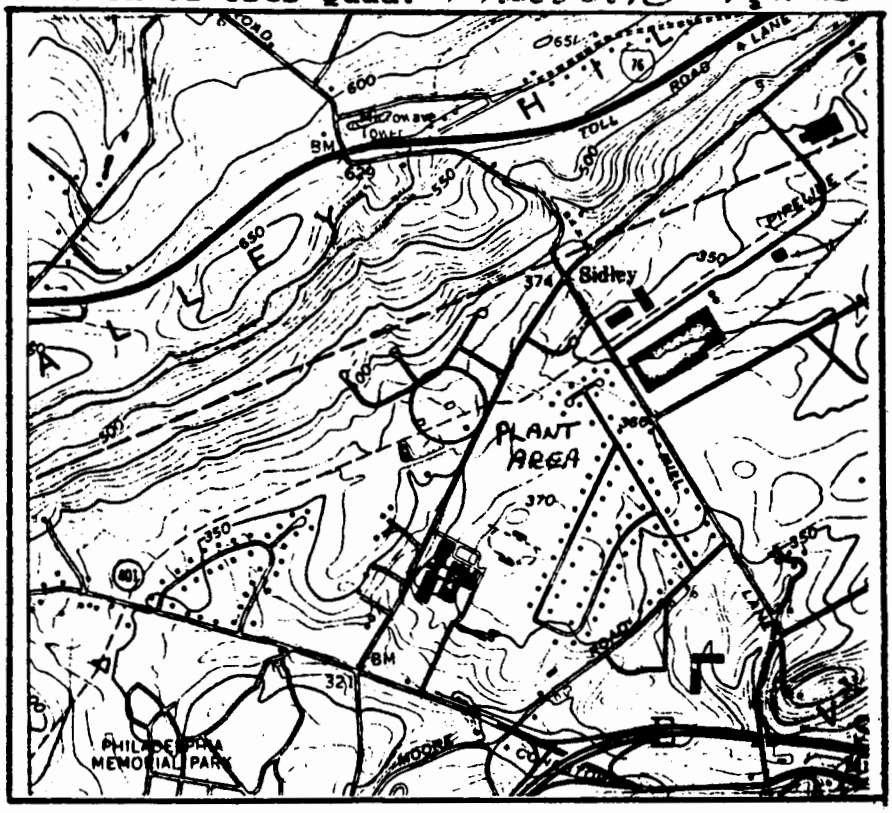
Identified on plot plan:

wells roads
springs property l'ns
pipelines electric l'ns
surface water bodies

Site/Well identified by: stakes Casing

Completed by: T. Moorehead
Date: 9/80

Portion of USGS Quad: Malvern 7½ min



Date: photo revised 1973' Scale: 1"=2000'
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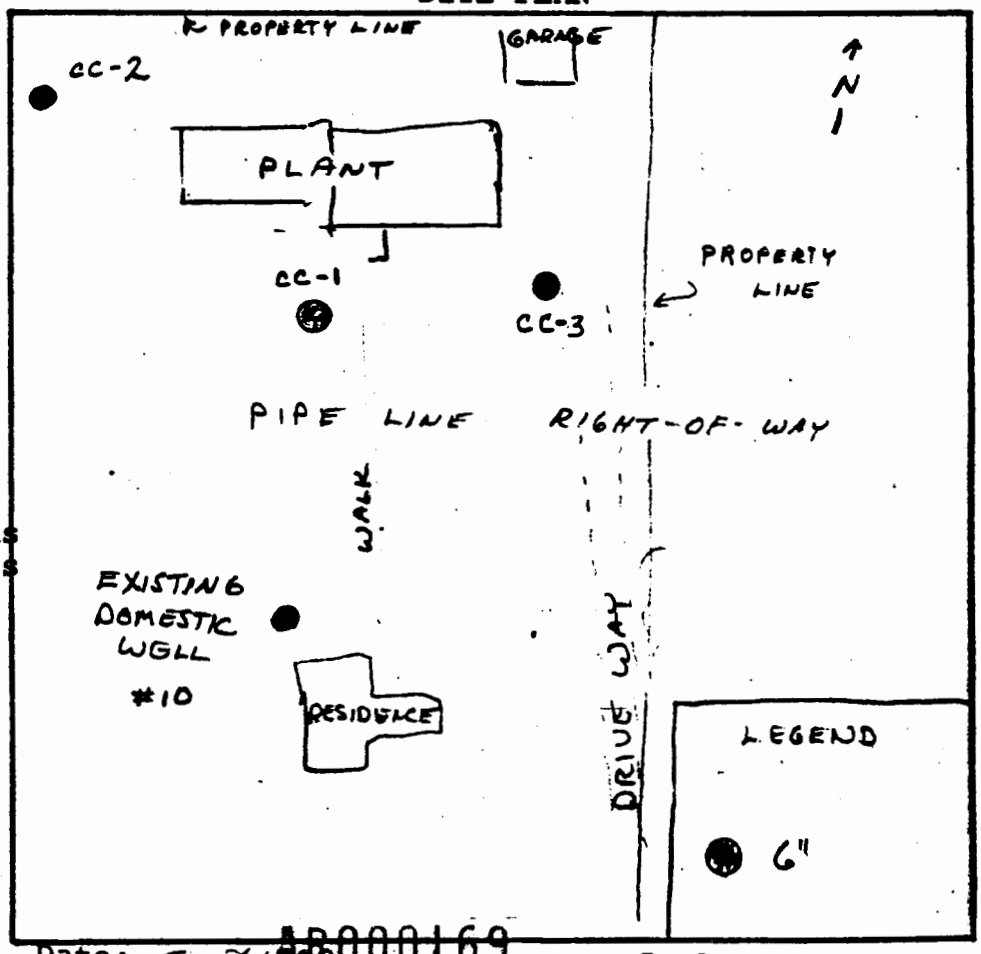
SITE PLAN



Date: Sept 1980 Scale:

LOCATION MAPS
FIGURE 5

Project: Chemclene Corp

Well Chemclene Corp

State: Pennsylvania

Portion of USGS Quad: Malvern 7½ min

County: Chester

Town/Township: East Whiteland

Street: Behind Hillbrook Circle

Tract:

Topographic setting: valley-side hill

Physiographic province: Piedmont

Geologic formation: colluvium over carbonate

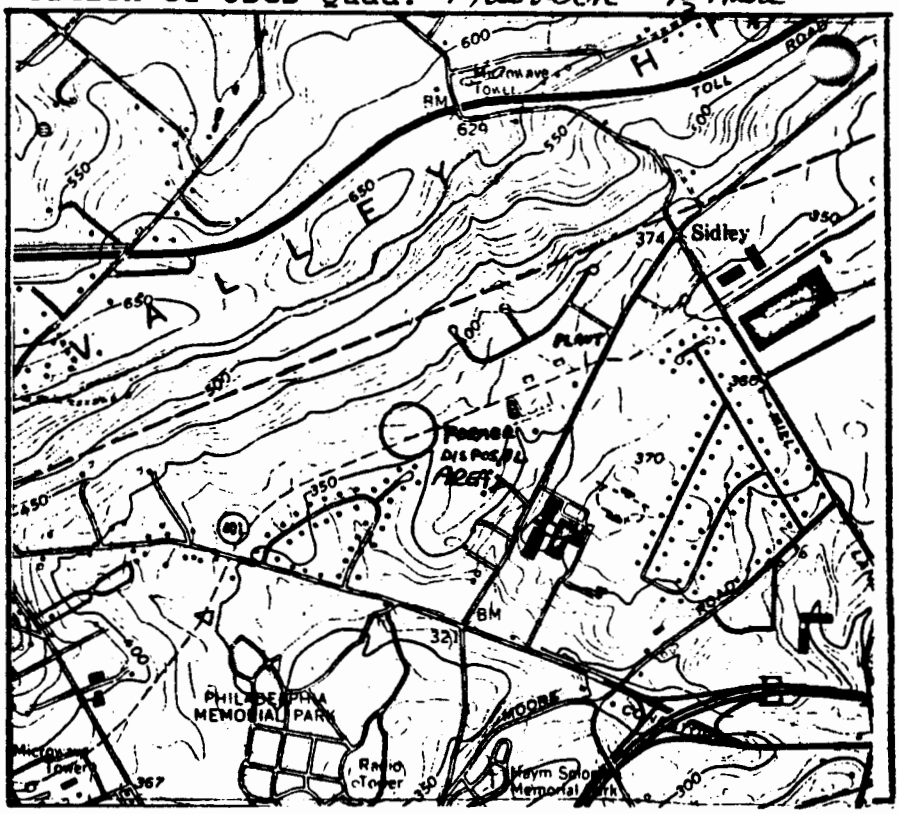
Longitude:

Latitude:

Elevation at surface: 360 - 370'

Flood elevation: none

Flood potential: none



Date:

Scale:
Contour Int: 10'

Locations also plotted:

Access problems:
all Chemclene

Site plan prepared by:
T. Moorehead

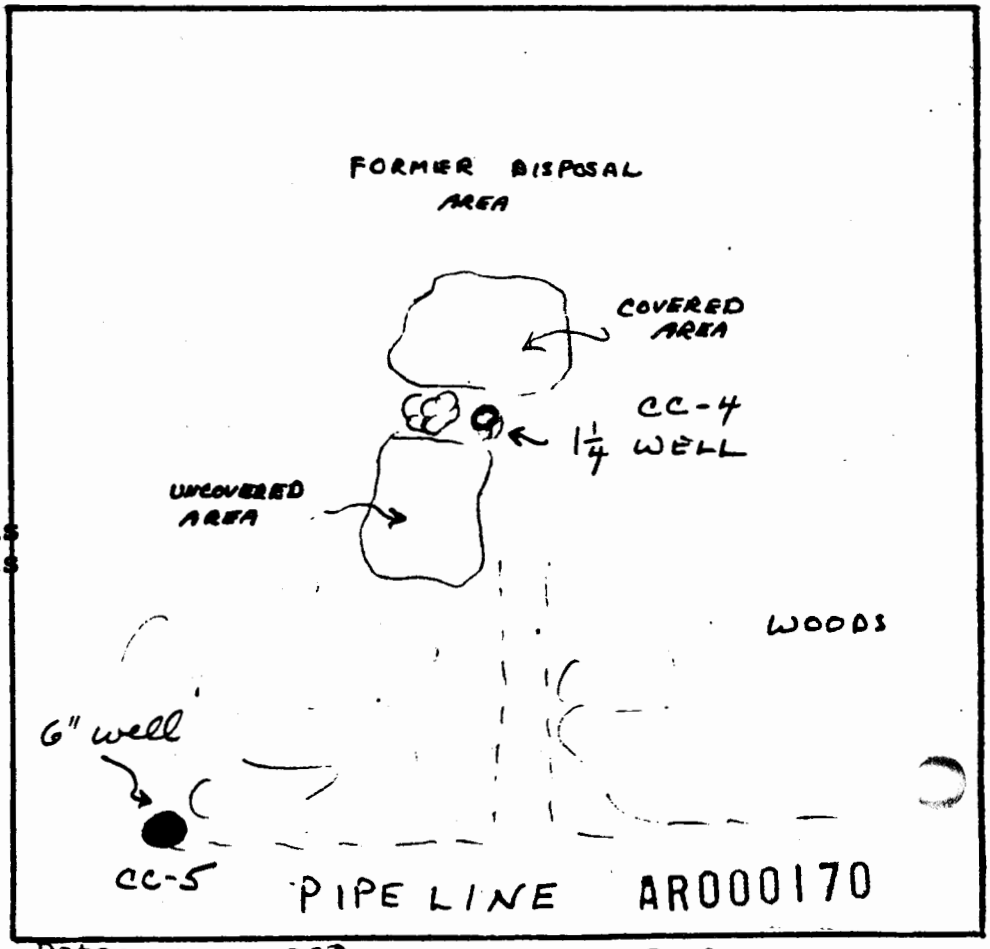
Identified on plot plan:

- ✓ wells
- ✓ roads
- springs
- property l'ns
- ✓ pipelines
- electric l'ns
- surface water bodies

Site/Well identified by:
Stakes
well casing

Completed by: T. Moorehead
Date: 9/80

SITE PLAN



Date: Sept 1980

Scale: none

of wells CC-2 and CC-3 respectively. The recorder indicated a slight (.05 foot) response in each of these wells when the other wells were being drilled. The small degree or relative lack of response between the wells can be attributed to their relatively low yield or to the lack of sufficient permeability between them.

Upon the completion of all construction, the monitoring wells were developed with air until turbidity had decreased to a reasonable degree. Due to constraints imposed during construction and on-site overburden conditions, it will probably be difficult if not impossible to ever develop these wells so that turbidity-free water can be obtained.

Water Level Measurements

A considerable amount of water-level data had been collected from area wells during the previous, 1977-1978, investigation (see References). Additional data was collected from these same wells and from new wells as part of the present investigation. All water-level measurements were made from pre-established measuring points, usually the lip of a well seal or the well casing. The elevations of many of these measuring points had been determined as part of the 1977-1978 investigation. The elevations of new wells, including the monitoring wells, were determined for Moorshead-Siddiqui and Associates by the Philadelphia Suburban Water Company.

Water-level measurements made during the present investigation and selected water-level measurements collected

previously are provided in Appendix C. The numbers of the wells indicated on the measurements forms coincide with the numbers given to the wells during the inventory phase of the investigation. In addition the locations of all wells measured are indicated on Figure 3. The water-level elevations in each well have been calculated by subtracting the depth to water from the elevation of the measuring point. The elevation data was then used to produce appropriate water-level contour maps of the area (see Figure 6).

Collection of Water Samples

Water samples were collected in series from area wells and from the monitoring wells on several different dates. As previously discussed, the most complete collection and analysis of water samples took place in May and June of 1980. Since that time, additional samples have been collected particularly from the monitoring wells on the Chemclene property.

All samples taken during the investigation were collected using accepted procedures and sample containers approved for the sampling of chlorinated hydrocarbons. If any delay was anticipated between the time samples were collected and the time they would be analyzed, they were refrigerated. Domestic wells were sampled at the closest point to the well in each home. Samples were collected ahead of water conditioning or treatment equipment if such equipment was being used. Results of an analysis of samples collected from area wells appears in Table 1.

TCE Concentrations

Well No.	Concentration	Well No.	Concentration	Well No.	Concentration
1	0.0	24	N.S.	47	0.0
2	0.0	25	0.0	48	0.0 (DER)
3	0.0	26	N.S.	49	0.0
4	0.0	27	N.S.	50	0.0
5	2.5	28	N.S.	51	.5
6	32.4	29	N.S.	52	0.0
7	0.0	30	N.S.	53	0.0
8	0.0	31	N.S.	54	0.0
9	75.6	32	N.S.	55	0.0 (DER)
10	1330.0	33	N.P.	56	14.3
11	N.S.	34	N.S.	57	11.4
12	N.S.	35	1.2	58	2.9
13	N.S.	36	2.6 (DER)	59	0.0
14	N.S.	37	N.S.	60	0.0
15	27.0	38	N.S.	61	0.0
16	8.8	39	N.S.	62	N.S.
17	15.0	40	N.S.	63	0.0
18	N.P.	41	190.5	64	0.0
19	13.3	42	0.0	65	.12
20	.3	43	0.0	66	N.P.
21	N.P.	44	.5	67	.4
22	N.P.	45	0.0	68	N.D.
23	13.0	46	0.0	69	N.D.

NOTE: N.S. - not sampled, not in study area or a non-flowing spring
N.P. - no pump
DER - result obtained from DER
N.D. - not drilled at the time of sampling

Table 1 - Results from water samples collected from wells in the vicinity of the Chemclene Corporation, Frazer, Pennsylvania. The wells were sampled May 8 and 9, 1980, and June 13, 1980, and analyzed for TCE. All results are in micrograms/liter.

Water samples were collected from Monitoring Wells CC-2, CC-3 and CC-5 on May 7, 1981, using a portable electric submersible pump and generator. Monitor Well CC-4 was not sampled because the water level had dropped below the bottom of the screen in the well. Monitor Well CC-1 was not sampled because the well had collapsed to a point at or above the water level in the well. If the water level rises in either of these wells, it may be possible to collect water samples from them.

A procedure for sampling these three monitoring wells was selected to minimize cross contamination from well to well. This was accomplished by pumping the least contaminated well (CC-5) first. Between the collection of each sample, the pumping equipment was thoroughly rinsed with uncontaminated water. Prior to and during sampling, water-level and flow measurements were made in each well. From this information, the relative productivity of each well was then determined. Results of these measurements appear in Appendix D.

Monitor Wells CC-2 and CC-3 were pumped for 60 minutes and sampled at 3 different times. Monitor Well CC-5 was pumped for 30 minutes and was likewise sampled 3 times. The results of the analysis performed on these samples appears in Table 2.

Collection of Soil Samples

Due to the age and nature of the problem and the thickness of the overburden in the area, soil sampling would not provide any meaningful or useable results. For these reasons, the

Monitor Well	Elapsed Time in Minutes	1,1,1-Trichloroethane	TCE	PCE
CC-2	10	12.4	57.8	7.3
	20	13.3	62.2	7.0
	60	17.0	64.1	3.0
CC-3	30	2,080.	12,600.	1,120.
	40	2,230.	12,600.	1,170.
	60	1,690.	10.500.	885.
CC-5	5	586.	1,180.	861.
	20	627.	1,310.	904.
	30	572.	1,270.	743.

Table 2 - Results of chlorinated hydrocarbon analysis of Chemclene monitoring wells, Samples collected May 7, 1981. All results in micrograms per liter.

sampling and analysis of soils was not undertaken at this time.

Laboratory Analysis

Samples collected during the investigation were all analyzed by Cedar Grove Laboratories, Downingtown, Pennsylvania. Analyses were performed on a Perkin-Elmer, Sigma-1, gas-liquid chromatograph with electron capture detectors. Liquid-liquid extractions were made using approved techniques. Detection limits to a level of .05 micrograms/liter were possible with this equipment.

ANALYSIS OF RESULTS

Flow System Description

The groundwater flow system in the vicinity of the Chemclene property is fairly typical of that developed on the edges of carbonate vallies in southeastern Pennsylvania. Work undertaken during the present investigation further defined and quantified the groundwater flow system both in terms of flow directions and contaminate concentrations. In trying to define the subsurface flow system in the area, it must be realized that the system changes with time. Seasonal periods of groundwater recharge, difficient recharge due to drought, artificial withdrawals from wells and quarries all combine to effect the flow system both in time and space. During 1981 the Chemclene property and surrounding area were subjected to drought conditions as was most of southeastern Pennsylvania. During this period water levels in wells

dropped to near record lows. Water levels collected during January 1981 averaged 3.7 feet lower than the average levels measured in wells during the investigation undertaken in 1977 and 1978. Depressed water levels due to drought combined with the increased discharge from the Great Valley Well and quarries in the Devault area have resulted in a locally suppressed water-table. The water-level contour map prepared from a compliation of water-level data collected during January 1981 (see Figure 6) indicates two major flow directions in the area of the Chemclene property. Ground water south of Hillbrook Circle flows toward the Great Valley Well. Groundwater flow in the vicinity of the former disposal area and the plant area is most probably northeastward toward Devault and Cedar Hollow. The flow direction toward Devault parallels major faults mapped in the area.

Due to the high permeability in the carbonate rocks underlying the area, the water-table is relatively flat. Only a 5-foot difference in water-table elevation exists over most of the area. The lack of water-table relief makes constructing contour maps more difficult. Groundwater velocities in the area on the order of 10 to 100 feet per day are probable especially along open fault and fracture zones.

The present groundwater flow regime depicted in Figure 6 explains in part the pattern of contamination depicted in Figure 7. Since the pattern of groundwater flow may have changed in time due to drought; residual areas of contami-

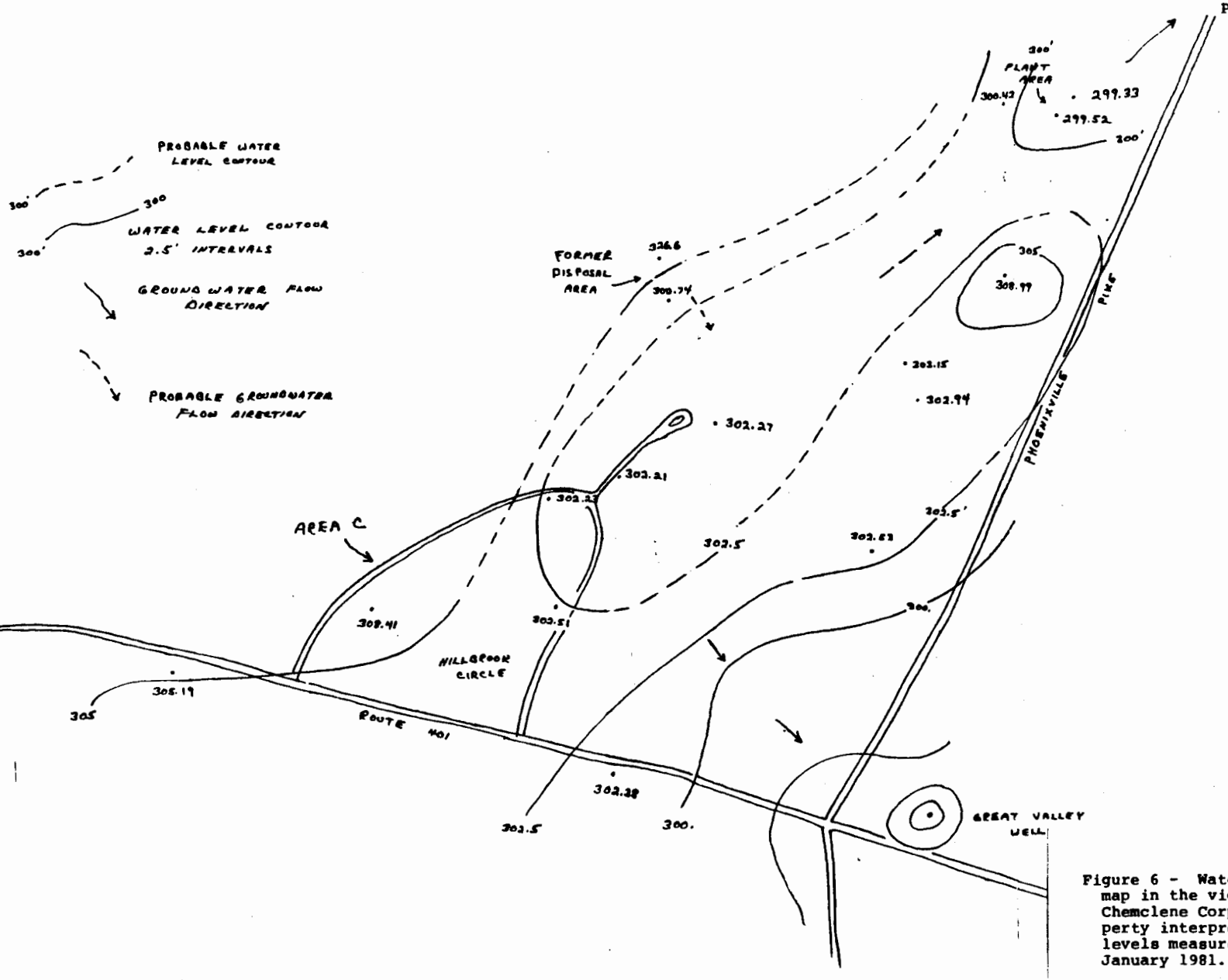


Figure 6 - Water level contour map in the vicinity of the Chemclene Corporation property interpreted from water levels measured during January 1981.

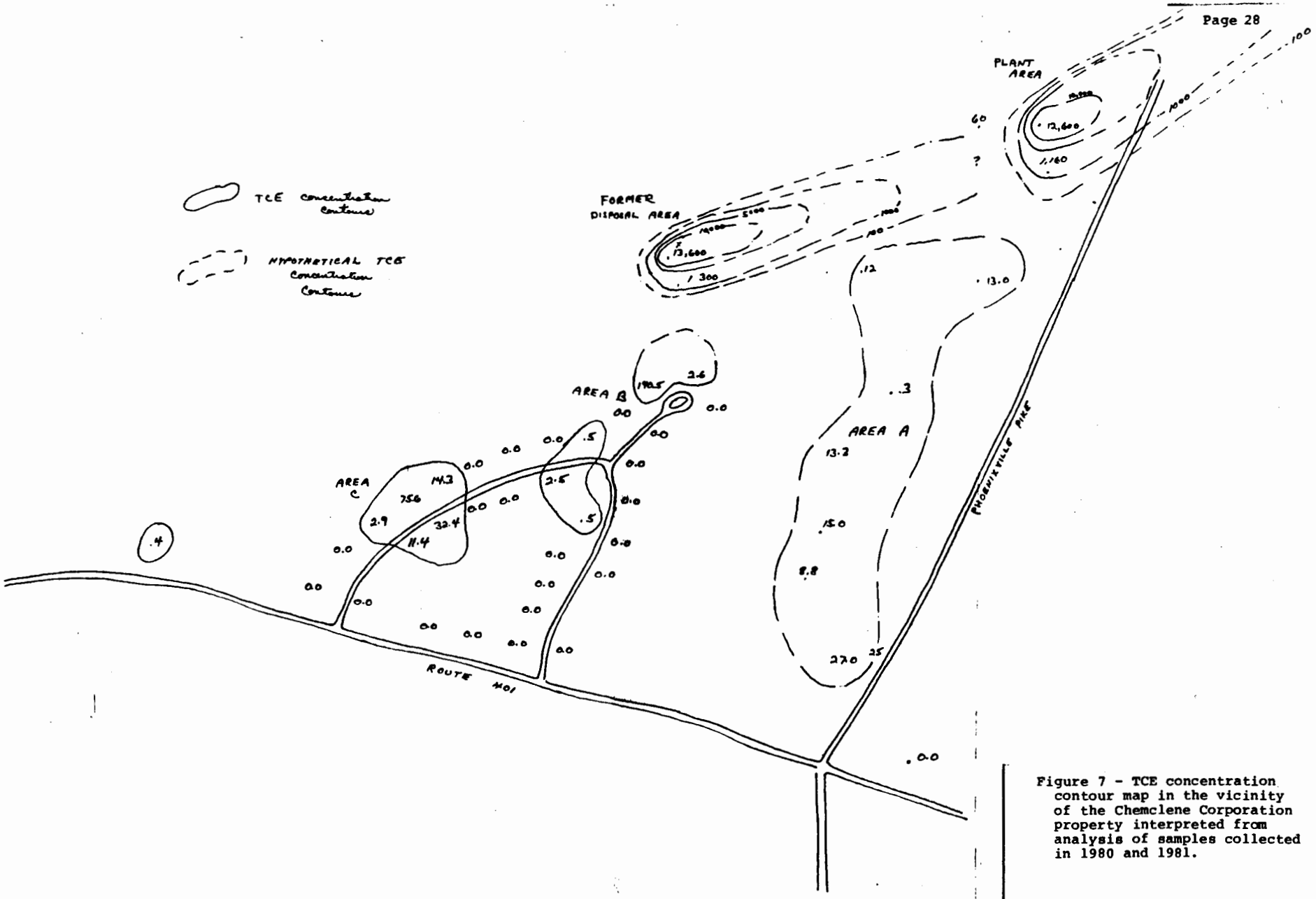


Figure 7 - TCE concentration contour map in the vicinity of the Chemclene Corporation property interpreted from analysis of samples collected in 1980 and 1981.

nation can be expected to remain in the area adjacent Phoenixville Pike (area A) and in Hillbrook Circle (area B).

Subsurface Distribution of Chlorinated Hydrocarbons

The results of the analysis of samples collected during 1980 and 1981 were used to prepare the concentration contour map indicated on Figure 7. TCE concentrations were used as an indicator parameter for the purposes of delineating contamination patterns. Figure 7 indicates that two principal areas having high TCE concentrations are present in the area. These areas are in the vicinity of the plant and at the former disposal area. Other areas having much lower concentrations are designated as areas A, B, and C and are indicated on Figure 7. While possibly related to the two main areas, these additional areas are thought to be distinct enities having their own origins and explanations.

Plant Area Contamination

While the total extent of contamination leaving the plant area was not defined due to limitations in obtaining places to drill monitor wells, it can be said on the basis of data collected to date that a plume of TCE and other chlorinated hydrocarbons should be found trending in a northwest direction. The plume's axis is probably along a major fault and concentrations probably diminish in a down gradient direction fairly rapidly. Since there are no nearby wells in that direction (everyone is using

public water) there are no sampling points from which samples can be collected to determine exact concentrations. The Martin-Marietta Corporation was contacted to obtain permission to sample their sump but to date they have not responded in a positive manner.

Former Disposal Area Contamination

High concentrations of chlorinated hydrocarbons including TCE were found in Monitor Wells CC-4 and CC-5 at the site of the former disposal area. Based on the evidence at hand, it is possible that subsurface discharge from the former disposal area also moves northeast from the site. Movement is probably along the same fault which underlies the plant site. Contamination emanating from the former disposal area may overlap and become indistinguishable from that possibly contributed in the area of the plant.

Area A Contamination

TCE levels within area A are possibly the result of the residual distribution of a contamination plume left over from when the groundwater flow system may have had a much different pattern than it does today. Before the groundwater trough created by pumping in the Devault area "captured" groundwater flow under the Chemclene property, flow may have been toward Valley Creek. Possible contamination from the plant site may have resulted in the formation of a plume along flow lines in that direction. As a result of starting a new quarry in Devault, the flow pattern may have changed.

Recharge which would greatly reduce concentrations in time would tend to cause the pattern indicated on Figure 7 to develop. If present conditions continue, it is expected that TCE levels within area A will continue to slowly diminish. Some of the contamination in area A could also be the result of septic system cleaners. It is impossible to reconstruct past flow systems and concentrations. No data was collected because no one ever anticipated or expected a problem to develop.

Area B Contamination

A possible explanation for the presence of TCE in 5 wells within area B is similar to that offered for area A except that the original source of TCE may have been the former disposal area. It is also very possible that the source could have been one or more attempts to unclog septic fields with off-the-shelf chlorinated hydrocarbon based drain cleaners. As long as flow patterns remain as indicated on Figure 6, TCE levels may likewise diminish within area B. Samples should be taken from time to time from wells in both areas A and B, not only to check carbon filter performance but also to determine future long-term trends.

Area C Contamination

The source of TCE in wells within area C is unknown. Because no plausible flow or geochemical pattern would indicate that the former disposal area could be a present

or past source of contamination within area C, it is assumed that an alternative source is responsible. Two possible sources are suggested. Clogged septic systems have been a continuous problem in the Hillbrook Circle area. It is very possible that one or more residents within area C have used a drain and tile field cleaner having a chlorinated hydrocarbon base. Such septic system cleaners were commercially available and widely used in the past. Possible use of septic system cleaners have been used to explain many anomalous levels of TCE (in the 0 to 150 ppb range) in other areas not related to this study.

A second possible explanation for the presence of TCE within area C is that an episode of clandestine dumping may have taken place behind Hillbrook Circle. Undetected access from Route 401 is available along the abandoned railroad right-of-way and the gas pipe line. Trucks known to have carried chlorinated hydrocarbon wastes frequented 401 on their way to a disposal area on Worthington Road not far from Hillbrook Circle. When conditions were not favorable for dumping at Worthington Road, a truck could have easily slipped undetected into the woods behind Hillbrook Circle.

Levels in area C should also be monitored and if they do not diminish then a separate investigation should be undertaken by DER in this area to determine materials present and their relative ratios; this may further define a possible source.

Sources of Contamination

The explanations offered for the presence of TCE in areas A, B and C are hypothetical at best. There presently exists no direct evidence to indicate the actual present or past source(s) of the contamination. Because the flow system in the area appears to have changed slowly but significantly over the past 20 years, it will be impossible to ever know how areas A, B and C really became contaminated.

PROPOSED REMEDIAL ACTIONS

Site Clean Up

Delineation of a groundwater quality problem becomes most meaningful when corrective actions are taken, if warranted. Corrective actions can include preventing any additional contamination from occurring in the future and undertaking reasonable clean-up efforts to help restore the contaminated aquifer to its original quality. Even before the initial phases of the present groundwater investigation were completed, the Chemclene Corporation moved systematically to remove any potential future source of groundwater contamination. These steps included the following:

1. Placement of a concrete pad under the bulk loading and unloading area at the plant.
2. Disposal of condensate water from the distillation process at an approved facility off-site.
3. Termination of outside drum storage.
4. Implementation of an employee safety training program with particular emphasis on spill prevention and control.
5. Elimination of the backlog of stored drums awaiting disposal.
6. Initiation of the removal and proper disposal of drums from the former disposal area.

Removal of the contents of the former disposal area and associated contaminated soils could eventually solve the groundwater contamination problem in that area. No removal or retrival wells at the site are recommended at present because the plume of contamination threatens no wells or uncontaminated portions of the aquifer. Once source materials are removed, natural recharge will reduce concentrations in the aquifer. Continued groundwater movement and discharge will eventually remove any remaining residuals.

Removal Well - Plant Area

Due to the potential size of the contamination plume and the possible age of the problem, extensive aquifer reclamation down gradient from the plant is not practical or presently necessary. However a retrival well near the plant could significantly reduce chlorinated hydrocarbon concentrations in the aquifer at that point and could significantly reduce the time needed for down gradient aquifer recovery.

Details concerning the implementation of a retrival well system will have to be approached on an experimental basis with DER's cooperation and approval. Elements of the retrival well system could include:

1. Deepening, reconstructing or moving Well CC-3 to develop a yield of between 35-45 gpm (this yield should provide an effective cone of influence in the area).
2. Developing insitu air injections or air lift techniques to reduce chlorinated hydrocarbon concentrations prior to additional treatment and disposal.
3. Pumping effluent to a properly designed and managed spray area to provide additional removal and ultimate disposal.

PRELIMINARY CONCLUSIONS

Based on hydrogeological investigations conducted by Moorshead-Siddiqui and Associates in the vicinity of the Chemclene Corporation property, the following preliminary conclusions are made:

1. Hydrogeologic conditions in the vicinity of the Chemclene property are complex.
2. Groundwater movement from the former disposal area and the plant area is presently northeastward.
3. In the past groundwater movement in the Chemclene area may have been toward the south and southwest.
4. The groundwater contamination problem in the vicinity of the Chemclene property is possibly an old one, more or less, in equilibrium with the present flow system.
5. Large scale withdrawals to quickly remove contaminated water or alter existing flow patterns is not practical, economically feasible or necessary at this time.
6. All wells with TCE concentrations greater than 4.5 ppb have been equipped with carbon filters as a precautionary measure.
7. No uncontaminated wells or uncontaminated portions of the aquifer appear to be threatened by the existing situation.
8. Removal of materials from the former disposal area and prevention of any leaks or spills at the plant site should prevent continued contamination of the aquifer from occurring.
9. Removal and treatment of 35-45 gpm in the vicinity of the plant should affectively control the localized problem in that area.
10. Dilution and the natural and artificial discharge of contaminated water from the aquifer underlying the Chemclene property will eventually reduce concentrations to acceptable levels.

PRELIMINARY RECOMMENDATIONS

Based on the conclusions reached as a result of our preliminary investigation, Moorshead-Siddiqui and

Associates offers the following recommendations:

1. Continue the clean-up activities at the former disposal area. This would include the excavation and removal of all buried materials including certain contaminated soils at the base of the excavation. Clean up could take place over an extended time frame due to the age of the problem and present site conditions.
2. Surface drainage should be redefined in the vicinity of the excavation to minimize the inflow of surface water.
3. As excavation at the former disposal area proceeds, an investigation of techniques to best minimize groundwater inflow and outflow should be undertaken.
4. Efforts to prevent the recontamination of soils in the vicinity of the plant area should continue.
5. Well CC-3 should be deepened, reconstructed or moved so as to provide a yield of 35-45 gpm for removal purposes.
6. This well should be operated on a more or less continuous basis to provide containment and to remove chlorinated hydrocarbons from the aquifer.
7. Disposal of water from the containment and removal well could be through a spray irrigation system situated on the pipe line right-of-way or in the woods west of the plant. A variety of insitu aeration techniques should be investigated to significantly reduce TCE levels in the well prior to spraying.
8. Monitoring should continue in selected wells on a systematic basis until levels of chlorinated hydrocarbons are reduced to acceptable levels.

To the extent any of these activities will require the issuance of permits or approvals from governmental agencies, such conditions will have to be met and time frames adjusted accordingly. Possible further analysis of field data could yield additional conclusions. A more detailed review of clean-up options will have to be developed with corresponding cost analysis and implementation schedules.

SELECTED REFERENCES

Bascom, Florence, and Stose, G. W., 1938, Geology and mineral resources of the Honeybrook and Phoenixville quadrangles, Pennsylvania: U.S. Geol. Survey Bull. 891.

Hall, G. M., 1934, Ground water in southeastern Pennsylvania: Pennsylvania Geol. Survey, 4th Ser., Bull. W-2.

McGreevy, L. J., and Sloto, R. A., Selected hydrologic data, Chester County, Pennsylvania: U.S. Geol. Survey open-file report.

McGreevy, L. J., and Sloto, R. A., 1977, Groundwater resources of Chester County, Pennsylvania: U.S. Geol. Survey Water-Resources Investigation 77-67.

Poth, C. W., 1968, Hydrology of the metamorphic and igneous rocks of Chester County, Pennsylvania: Pennsylvania Geol. Survey, 4th ser., Bull. W-25.

In addition to the above published references a considerable amount of field data was developed in 1977 and 1978 in an unrelated hydrogeological investigation undertaken in the area. A study was initiated to determine the effects, if any, that Philadelphia Suburban Water Company's Great Valley Well may have had on the levels and yields of surrounding domestic wells. The study was undertaken by Philadelphia Suburban Water Company's personnel; Leggette, Brashears and Graham, Inc., consultants for Philadelphia Suburban Water Company and Moorshead-Siddiqui and Associates, pro bono consultants for area residents. Philadelphia Suburban Water Company's position concerning this matter was summarized in a report entitled:

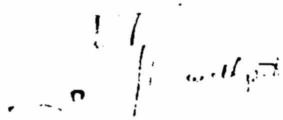
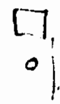
Investigation of alleged interference by the Great Valley Well on nearby private wells with particular emphasis on Hillbrook Circle.

prepared by their consultant. The report also contains much data concerning wells and water levels in the area.

Appendix A

Well Inventory - Area Wells

WELL INVENTORY AND TABULATION

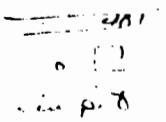
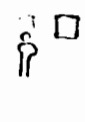
Well Number	1	2	3	4	5
Type of Well	domestic	drilled - domestic	drilled domestic	drilled - domestic	drilled - domestic
Depth		32-35'	90'	77'	60'
Casing Length			68 6"	65' 6"	6' 47.5'
Yield of Well			30 gpm	15 gpm	12 gpm
Drillers Name			Keyes	Keyes	
Drillers File Name			rig 23	rig 14A	rig 14A
Date Well Drilled			10-6-77	11-19-77	6-14-77
Location re Bldgs.					
W/L Measureable?	yes	buried [illegible]	yes	yes	yes
Elevation of M.P.	328.71'		337.09'		
Depth to Water			31' 8" (Keyes)	37' (Keyes)	25' (Keyes)
Elevation of W/L					
Date of Measurement			10-6-77	8-31-77	6-14-77
Type Pump	submersible		submersible	submersible	submersible
Treatment?					
Quality hardness					
Comments	hole next to casing old well	old well	lost water new well old well 35' deep	lost water new well old well 60-65'	lost water new well old well 44' deep
Owners Name	Rubino	Mannarino	~~Dowd~~ OBRIEN 1981	Wheeler	[illegible]
Phone Number					
Plotted	8 Hillbrook	4 Hillbrook	11 Hillbrook	23(?) Hillbrook	26 Hillbrook

AR000190

WELL INVENTORY AND TABULATION

Well Number	6	7	8	9	10
Type of Well	drilled - domestic	drilled - domestic	drilled - domestic	drilled domestic	drilled - domestic commercial
Depth	94'	100'	148'		199'
Casing Length	90' - 6"	28' 6" - 6"	110' 6"		60'
Yield of Well	20 gpm	12-15 gpm	25-30 gpm		8 gpm
Drillers Name	Keyes	Keyes	Keyes		Petroleum
Brillers File Name	rig 14	rig 14A	Waltman		Summ-
Date Well Drilled	11-26-77	10-14-77	Oct 9 1972		Sept 1978 Sargent
Location re Bldgs.			Or #8		
W/L Measureable?	yes	yes	yes	no	yes
Elevation of M.P.					
Depth to Water	45' (Keyes)	55-60 (?) (Keyes)	25' (Keyes)		50'
Elevation of W/L					
Date of Measurement	11-26-77	10-14-77	10-9-72		1954
Type Pump	submersible	submersible	submersible	yes	sub
Treatment?					
Quality hardness					
Comments	lost water new well	lost water new well	Phila Sub mess 1973- new wtd. (Waltman)	pit but no hole in seal previous Kitten	pump runs alot leak in system no electric used
Owners Name	O'Neil	Bird	Watson (new wtd)	Carl Messick	Bai...
Phone Number	647-4840				
Plotted	yes	yes	yes		yes
	32 Hillbrook	36 Hillbrook	15 Hillbrook	33 Hillbrook	

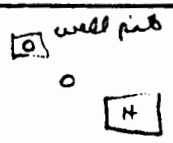
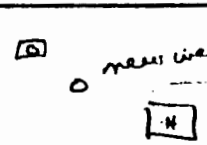
WELL INVENTORY AND TABULATION

Well Number	11	12	13	14	15
Type of Well	test	drilled - domestic	dug/bored domestic	dug/bored domestic	dug/bored [illegible]
Depth		80-90			1
Casing Length	8'				
Yield of Well		8 gpm			
Drillers Name		Geo. Brookover	Pedersen		
Drillers File Name					
Date Well Drilled		3 yrs ago			
Location re Bldgs.					
W/L Measureable?	yes	yes	pedge	yes	
Elevation of M.P.					
Depth to Water		30' + 10"			
Elevation of W/L		11 AM - 11-26-77			
Date of Measurement					
Type Pump		submersible			
Treatment?					
Quality hardness					
Comments			well pit & [illegible] water	old well no problems '62-'66	[illegible] need tube
Owners Name	Phila Suburban Water Co.	Spruce [illegible] Bishop Rd.		Bernarden	Mc [illegible]
Phone Number					
Plotted					RD # Plum Pike

AR000192

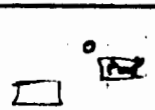
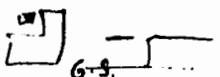
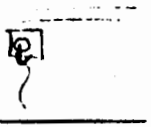
22 21
45' + 16½' 45'

WELL INVENTORY AND TABULATION

Well Number	16	17	18	19	20
Type of Well	drilled domestic.	drilled domestic	drilled domestic	drilled domestic	drilled-domestic
Depth	~120	100'	95'	180'	200'
Casing Length		87'	55' bird.	60'	142'
Yield of Well		15 gpm		50 gpm @ 150'	50 gpm @ 120'
Drillers Name		Tom Keyes		Peterson	Peterson
Brillers File Name		Dec 1954 56-gpm eqp			
Date Well Drilled				Jan 24, 1977	Jan 1, 1977
Location re Bldgs.		 in pit	 well pit	 new well	
W/L Measureable?	no buried	yes	yes	yes	yes
Elevation of M.P.					
Depth to Water					
Elevation of W/L			lip of flagstone		
Date of Measurement					
Type Pump	jet	jet	open.	submersible	submersible
Treatment?					
Quality -hardness-					
Comments	Cooperative	M.P. lip of Conc. blocks - near b.s. no problems	reported to have caved in	new well old one had problems	new well old one had problems.
Owners Name	McLaughlin	Tamaey	Beaver old	Beaver new	Neal Hoppes
Phone Number				Kocher	
Plotted					

PROJ 193

WELL INVENTORY AND TABULATION

Well Number	21	22	23	24	25
Type of Well	drilled pool well	drilled domestic	drilled domestic	dug domestic	spring
Depth	110' -		73'	~10'	1.5'
Casing Length	32'				
Yield of Well	20 gpm		good.		5 gpm
Drillers Name	John L. Trego		?		
Drillers File Name					
Date Well Drilled	aug 20 1964				
Location re Bldgs.		 MP lip of well pit.	 MP 2' below G.S.		
W/L Measureable?	yes	yes	yes - under turbine	yes	yes
Elevation of M.P.					
Depth to Water					
Elevation of W/L					
Date of Measurement					
Type Pump	submersible	open	turbine		
Treatment?					
Quality hardness				probably contaminated	
Comments	pumps level 60 from drillers bill	old well well is open.	20' 6" water 1960's		
Owners Name	Hoopes	Hoopes	Mc Donald	Lewis	Liberty Mutual
Phone Number					
Plotted					

WELL INVENTORY AND TABULATION

Well Number	USGS 269 / 26	USGS 271 / 27	USGS 270 / 28	/ 29	/ 30
Type of Well	drilled - semi public	drilled semi public	drilled semi public		drilled - domestic
Depth	135'	130'	139'		80'
Casing Length	131' - 6"	129' 6"	106' 6"		
Yield of Well	30 gpm	75 gpm	50 gpm		
Drillers Name	Keyes	Keyes	Keyes		
Drillers File Name	rig 6 BE	rig 2	rig 7		
Date Well Drilled	8-19-54	9-25-59	10-18-61		1930's
Location re Bldgs.					
W/L Measureable?					
Elevation of M.P.					
Depth to Water	70'	65	50'		
Elevation of W/L					
Date of Measurement	9-17-54	11-18-59	10-18-61		
Type Pump					deep well jet
Treatment?					
Quality hardness					
Comments	pumping level 75' crushed stone	Pumping level 125'	pumping level 120' 91-139' limestone		measured levels during test 5'-16' before well cons.
Owners Name	Kaye Boston Hill Trailer	Kaye Boston Hill Trailer	Kaye Boston Hill Trailer		Sandsmith
Phone Number					
Plotted					

B 00 — 65

WELL INVENTORY AND TABULATION

Well Number	31	32	33	34	35
Type of Well	drilled domestic	drilled - domestic	drilled - domestic	drilled - dom	spring house
Depth		80' rock		~300'	
Casing Length					
Yield of Well					
Drillers Name		avondale now dead			
Drillers File Name					
Date Well Drilled	~1952			~1948	
Location re Bldgs.	o 31 401	32 401	in pit	34	401 large spring house
W/L Measureable?	yes	yes	yes open	yes	yes
Elevation of M.P.				~360' TOP	lip of cap 325.17
Depth to Water					
Elevation of W/L					
Date of Measurement					
Type Pump		jet	turbine removed.	jet	
Treatment?					
Quality hardness					
Comments		cloudy water no well seal	abandoned. cased for reloader.		
Owners Name	Mc Lucas	Keller	Watson (old well)	Phila Navy Yard	
Phone Number					
Plotted					

AR000196

WELL INVENTORY AND TABULATION

Well Number	36	37	38	39	40
Type, Use of Well	drilled domestic	drilled	spring	spring	
Depth, diameters	6".	201' 6"			
Casing Length, dia.		185 6			
Yield of Well		100-150 gpm			
Drillers Name		T. Keyes.			
Drillers File Name		B.E. Wallace Rus			
Date Well Drilled		3-18-65			
Location re Bldgs.			in bank of valley area ~~large + gone~~	small spring house corner of water area	
W/L Measureable?	yes		yes	yes.	
Elevation of M.P.					
Depth to Water		100'			
Elevation of W/L					
Date of Measurement		3-26-65			
Type Pump					
Treatment?					
Quality hardness					
Comments					This may have been spring on McQuiston
...ers Name	V. Calloway	B.E Wallace	McQuiston	McQuiston	
...ne Number					
...tted					

A000197

WELL INVENTORY AND TABULATION

Well Number	41	42	43	44	45
Type, Use of Well			domestic		
Depth, diameters			75'		
Casing Length, dia.					
Yield of Well					
Drillers Name					
Drillers File Name					
Date Well Drilled			1961		
Location re Bldgs.					
W/L Measureable?	no buried	no buried	no buried	no buried	no buried
Elevation of M.P.					
Depth to Water					
Elevation of W/L					
Date of Measurement					
Type Pump			setting 70'		
Treatment?					
lity hardness					
ments	original well no data	original well no data	original well no data	original well no data	original well no data
ers Name	Robert Sewell	H. Smith	J. Lukowy	Steinmetz	T. Harkins
ne Number			644-6326		
Plotted					

WELL INVENTORY AND TABULATION

Well Number		46		47		48		49		50
Type, Use of Well										
Depth, diameters										
Casing Length, dia.										
Yield of Well										
Drillers Name										
Drillers File Name										
Date Well Drilled										
Location re Bldgs.										
W/L Measureable?										
Elevation of M.P.										
Depth to Water										
Elevation of W/L										
Date of Measurement										
Type Pump										
Treatment?										
ality hardness										
ments										
ers Name	Nicoms			McGrogan		Rosenberg		Wells		1371
one Number										
..tted										

WELL INVENTORY AND TABULATION

Well Number	51	52	53	54	55
Type, Use of Well	drilled abandon		domestic		
Depth, diameters					
Casing Length, dia.					
Yield of Well					
Drillers Name					
Brillers File Name					
Date Well Drilled					
Location re Bldgs.					
W/L Measureable?					
Elevation of M.P.					
Depth to Water					
Elevation of W/L					
Date of Measurement					
Type Pump					
Treatment?					
Quality hardness					
Comments	new well in 1968 filled + cemented		house drain + irrigate		
mers Name	Ingal Raffety	Spangal	Harry Swisher	A. Judge ?	Tarra
lone Number	( )	( )			( )
Plotted					

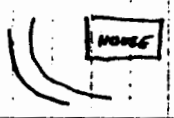
U020

WELL INVENTORY AND TABULATION

Well Number	56	57	58	59	60
Type, Use of Well					
Depth, diameters					
Casing Length, dia.					
Yield of Well					
Drillers Name					
Brillers File Name					
Date Well Drilled					
Location re Bldgs.					
W/L Measureable?					
Elevation of M.P.					
Depth to Water					
Elevation of W/L					
Date of Measurement					
Type Pump					
Treatment?					
Quality hardness					
Comments					
Owners Name	Knapp	Agnew	Stinneman	Debbie Albert	
Phone Number					
Plotted					

RD00020

WELL INVENTORY AND TABULATION

Well Number	61	62	63	64	65
Type, Use of Well					domestic - drille
Depth, diameters					6" 155'
Casing Length, dia.					6" 60'
Yield of Well					50 gpm
Drillers Name					Petroleum
Brillers File Name					Lupo
Date Well Drilled					aug 1979
Location re Bldgs.					
W/L Measureable?					yes
Elevation of M.P.					348.98'
Depth to Water					
Elevation of W/L					
Date of Measurement					
Type Pump					submersible
Treatment?					
Quality hardness					
Comments					
Owners Name	Eagle	Jones	Fry	Chappell	Jeff Lupo
Phone Number		( )			( )
Plotted ( )					

APR 2002

WELL INVENTORY AND TABULATION

Well Number		66		67		68		69	
Type, Use of Well	domestic	drilled			drilled	domestic			
Depth, diameters	80 ft	6"			82'	6"			
Casing Length, dia.	60 ft	6"			63'	6"			
Yield of Well	100 gpm				60 gpm				
Drillers Name	T. Keyes				T. Keyes				
Drillers File Name	Frank Cassidy				Raffaty				
Date Well Drilled	7-25-80				12-22-80				
Location re Bldgs.	on vacant lot								
W/L Measureable?	yes				yes				
Elevation of M.P.									
Depth to Water									
Elevation of W/L									
Date of Measurement									
Type Pump									
Treatment?									
Quality	hardness								
Comments					replacement for new well.				
Owners Name	Cassidy		T.M. Macario		Wayne Raffaty		Pompeo		
Phone Number									
Plotted			410 Comstock		10 Hillbrook		3 Hillbrook		

R0002203

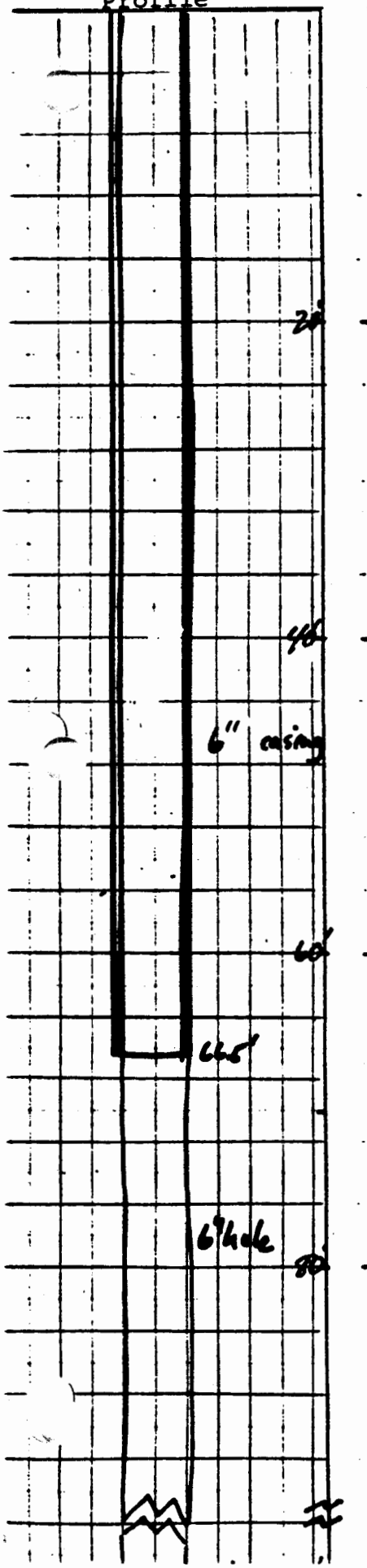
Appendix B

Well Construction Summaries - Chemclene Monitoring Wells

WELL CONSTRUCTION SUMMARY

Well CC 1
Plant Area
Project: Chemclene

Consolidated Formations



Surface elevation:
Desciption of M.P.: lip of 6" casing

Location: Chem Clene Corp., Malvern, PA
South of plant building

Date completed: 10/15/80
Driller: Keyes

Original yield: n/a date:
How determined:

Formations penetrated:
unconsolidated sands & clays
weathered dolomite or limestone

Total depth: 120'
Original static level: 64.55 Bm
Date: 10/17/80

Casing

Diameter	Depth
6"	66.5'

Grouting details:
backfill w/ cuttings & cement to surface around 6" casing

Plumbness & Alignment Test
Date: n/a

Geophysical logs:
n/a

Development Details:
Blown with air at end of drilling until clear

Pumping Test Details:

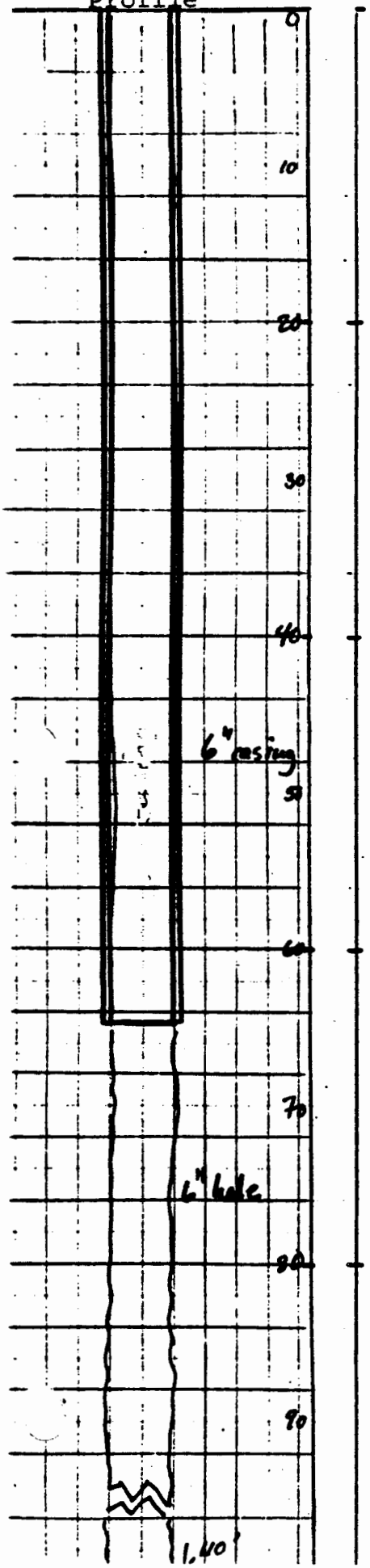
n/a

General Remarks:
hole collapsed.

Date: 12.18.80
Prepared by:

WELL CONSTRUCTION SUMMARY

Well CC 2
Plant area
Project: Chemclene



Suface elevation:
Desciption of M.P.: lip of 6" casing

Location: Chemclene Corp. Matoaca
west of plant building

Date completed: 10/16/80
Driller: Keyes

Original yield: n/a date:
How determined:

Formations penetrated:
sandy/clayey overborden
weathered carbonate

Total depth: 110'
Original static level: 60.63' BMP
Date: 10/17/80

Casing

Diameter	Depth
6"	64.5'

Grouting details:
backill w/ cuttings & cement
to surface around
casing

Plumbness & Alignment Test
Date:
n/a

Geophysical logs:
n/a

Development Details:
Blown w/ air at end of
Drilling until clear

Pumping Test Details:
Sonar plot of recovery following
drilling

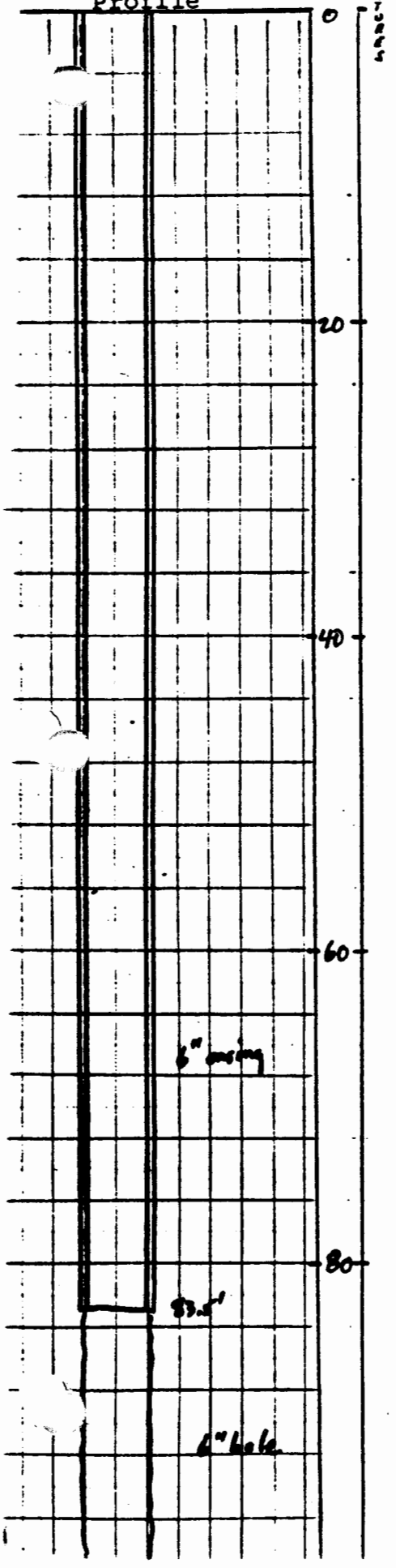
General Remarks:

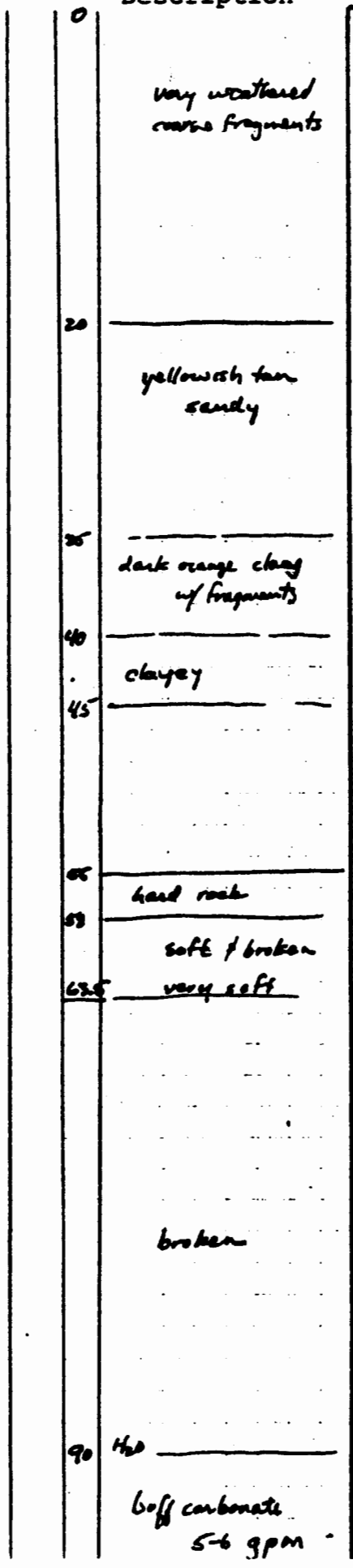
Date: 12-18-80
Prepared by:

WELL CONSTRUCTION SUMMARY

Well CC 3 (Plant Area)

Project: Chemclene





Suface elevation:

Desciption of M.P.: lip of 6" casing

Location: Chemclene Corp, Malvern
S.E. of plant building

Date completed: 10/17/80

Driller: Keyes

Original yield: n/a date:

How determined:

Formations penetrated:
sand & clay overburden
weathered carbonate

Total depth: 101'

Original static level: 71.01' BMP

Date: 11/7/80

Casing

Diameter	Depth
6"	83.5'

Grouting details:
backfill w/ cuttings & cement to surface around 6" casing

Plumbness & Alignment Test
Date: n/a

Geophysical logs: n/a

Development Details:
Blown with air at end of drilling until clear

Pumping Test Details:

n/a

General Remarks:

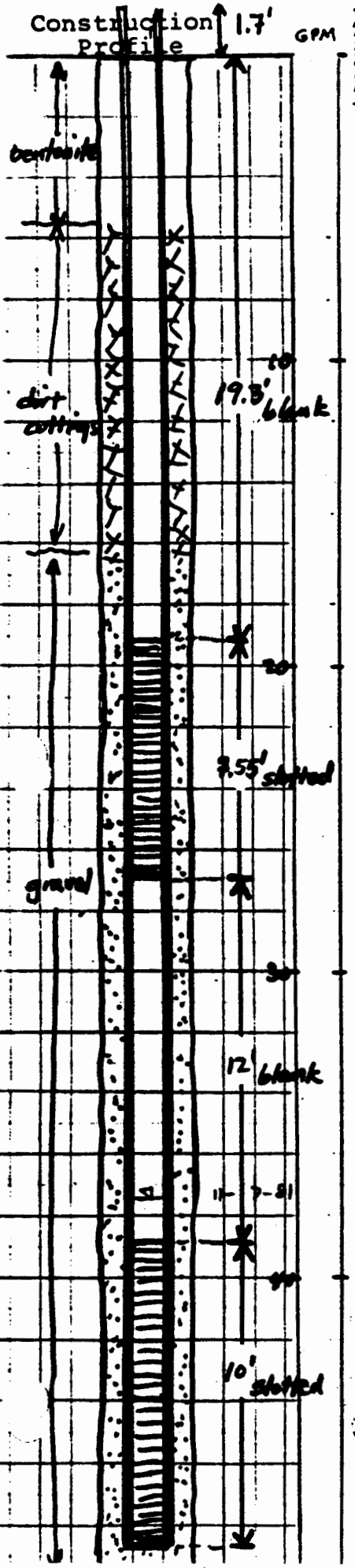
Date: 12-18-80

Prepared by: SCH

WELL CONSTRUCTION SUMMARY

Well CC 4 Disposal Area

Project: Chemclene



Consolidated Formations

LOG DEPTH | Description

see CC5

48.8
1.7
50.5

374.1

Suface elevation: 360-370'
Desciption of M.P.: lip of 1¼" pvc

Location: near barrel refuse pit in woods adjacent to pipeline
Date completed: 10-17-80
Driller: Keyes

Original yield: n/a date:
How determined:

Formations penetrated: clay & sand overburden, weathered rock

Total depth: 50'
Original static level: 37.15 BMP
Date: 11-7-80

Casing

	Diameter	Depth
	1¼	48.8' below G.S. tot
	1¼	19.3 - 26.8'
slotted	1¼	38.8 - 48.8'

Grouting details: gravel to above slotted pvc, cuttings to ~ 6' and bentonite to surface

Plumbness & Alignment Test
Date: N/a

Geophysical logs:

N/a

Development Details:

Blown with air at end of drilling until clear

Pumping Test Details:

n/a

General Remarks:

Date: 12/14/80

Prepared by:

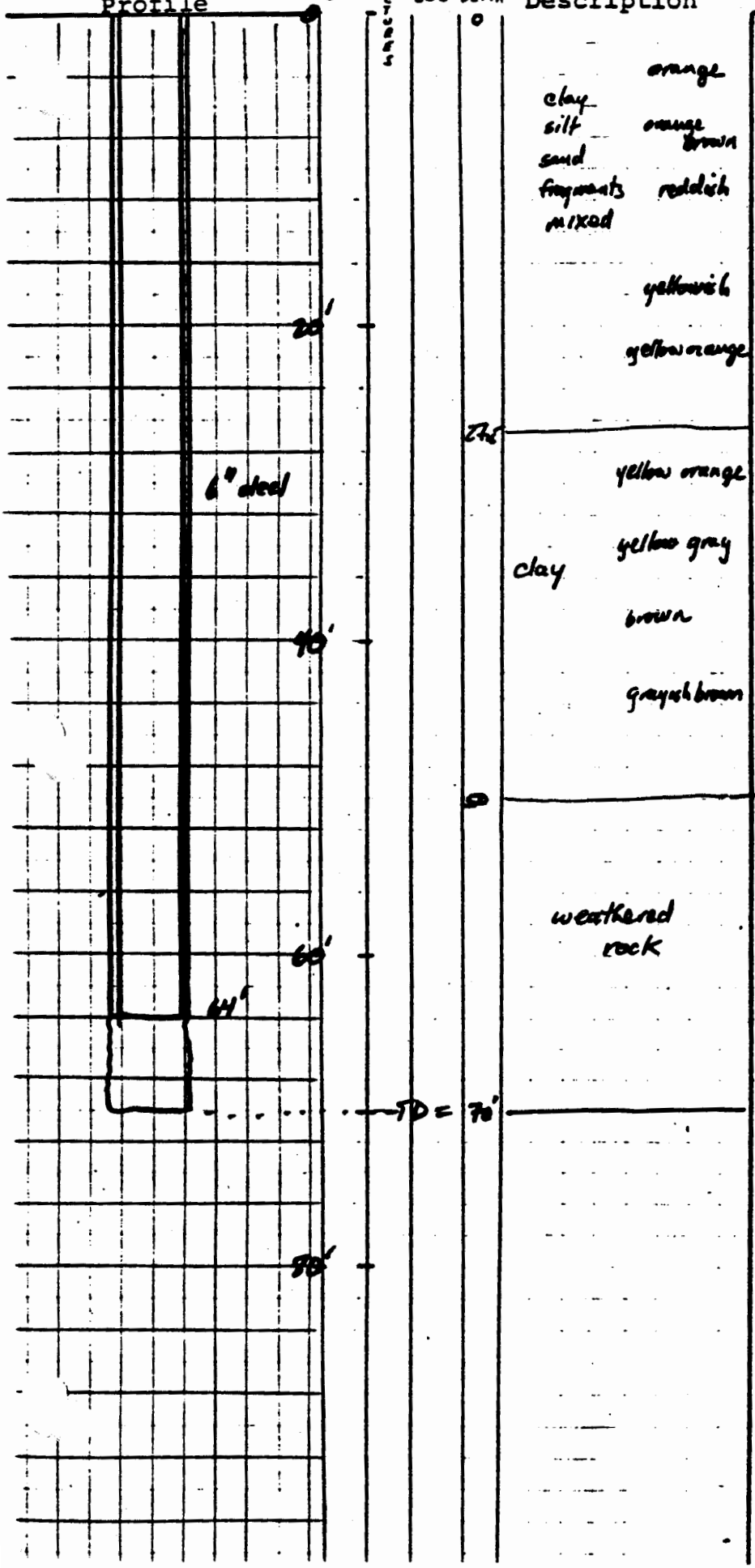
AR000208

WELL CONSTRUCTION SUMMARY

Well CC 5

Project: Chem Clean Disposal Area

Consolidated Formations



Suface elevation:

Desciption of M.P.: 1/4 of 6" steel casing

Location: on pipeline right of way near Chem Clean plant, Malvern

Date completed: 10-17-80

Driller: Keyes

Original yield: N/A date:

How determined:

Formations penetrated: clay & sand overburden, weathered rock

Total depth: 70'

Original static level: 59.8' BMP

Date: 11-7-80

Casing

Diameter	Depth
6"	64'

Grouting details: backfilled around 6" steel pipe with cuttings.

Plumbness & Alignment Test

Date: N/A

Geophysical logs: N/a

Development Details: Blown with air at end of drilling until clear

Pumping Test Details: N/A

General Remarks:

Date: 12/19/80

Prepared by:

AR000209

Appendix C

Water Level Data

Observation Wells During Pumping Tests

Pumping Well none

Project: Chem Clone

rvation Well	CC-1			CC-2			CC-3				
Description of Meas. Pt.	Top of 6" casing			Top of 6" casing			Top of 6" casing				
G.S.-M.P.	+ .9										
Elevation MP	370.33			367.34			375.35				
Distance to											
DATE											
10-17-80	8⁰³ A	64.55		8¹⁵	60.63			—			
		305.78			306.71						
11-1-80	1³⁵ P	65.76		1³⁰ P	61.92		1³⁷ P	71.01			
		304.57			305.42			304.34			
12-18-80	3¹⁵ P	68.26'	1	3³⁰ P	64.35	③	3⁰⁰ P	73.48			
		302.07			302.99			301.87			
1-28-81	~	70.81		4⁴⁰ P	66.91		4³⁰ P	76.02			
		299.52			300.43			299.33			
5-7-81		dry		10⁵⁵	68.02			—			
					299.32						
5-8-81		dry						77.50	2		
								297.85			

Remarks: 1 very muddy with total depth of hole ~ 69' - apparently hole has caved in below the casing at 66.5'

2 recovery after test

③ 2.56 difference

④ 2.54 difference

No. of remark

E.T.	LEVEL
CHECK	ELEV.

Sample:

AR000211

Observation Wells
During Pumping Tests

Pumping Well NONE

Project: Chem Clene

servation Well	CC-4			CC-5							
Description of Meas. Pt.	Lip of 1½" adapter			Lip of 6" casing							
G.S.-M.P.	= 1.7'										
Elevation MP	374.60			362.18							
Distance to											
DATE 11-7-80	150 p	32.15		154p	54.80						
					307.38						
12-18-80	401 p	32.74		350	56.91						
		341.86			305.27						
1-28-81		32.48	①	445 p	59.44						
		326.6			302.74						
5-7-81		dry.			60.32						
	>	324.1			301.86						

Remarks:

① less than 41.0' in hole.

No. of remark -

E.T.	LEVEL
CALC.	ELEV.

Sample:

AR000212

Observation Wells
During Pumping Tests

Pumping Well Crest Valley

Project: Hillbrook Circle
Phila Suburban

Observation Well	1 Kulpsville	2	3 Dowd	4 Whelan	5 Venezia
Description of Meas. Pt.	lip of well pit		lip of 6" casing 337.09	lip of 6" casing ? 339.42	lip of 6" casing
Date					
11-19-77	am 18.46 / 310.25	—	am 26.98 / 310.11	pm 29.24 / 310.18	27.85 / 309.10
1-3-78	[illegible] / 316.37		[illegible] / 315.84		
[illegible]	[illegible] / 317.66		19.51 / 317.58		[illegible] / 317.82
11-11-78	9[illegible]A 17.38 / 311.33		11[illegible]A 25.79 / 311.10	11[illegible]A 28.14 / 311.28	11[illegible]A 25.72 / 311.23
1-30-81	9[illegible]A 26.23 / 302.48		9[illegible]A 34.89 / 302.21	— —	
1-31-81					12[illegible] 34.72 / 302.23
9-10-81	28.99 / 299.72 1 2		10[illegible]A 37.51 / 299.58 2	29.72 / 299.70	29.25 / 299.70

Remarks: 1 to lip of cement well house
2 having problems w/ cloudy water

No. of remark

Sample: level

AR000213

Observation Wells
During Pumping Tests

Pumping Well ______________

Project: Planebrook Dump
Phila Suburban

Observation Well	6 O Niel	7 Bird	8 Watson (new well)	9 Hitson	10 Baldwster
Description of Meas. Pt.	lip of 6" casing	lip of 6" casing	lip of 6" casing	can't measure	remove lip on breather; lip of pit
Date	352.02	355.68	346.32		
					subt 8.30' than reading
					357.33
					9/ 50' / 315.6 ①
11-19-77	AM 41.81 / 310.21	AM 45.04 / 310.64	AM 36.22 / 310.10		Noon 54.54 / 302.79
1-4-78	3pm 35.51 / 316.51	3^{15} 38.69 / 316.99	2 pm 30.06 / 316.26		
1-10-78	10^{55}A 34.35 / 317.67	10^{55} 37.50 / 318.18	[illegible] 28.77 / 317.55		
3-4-78					11:45 52.89 / 304.44 ②
11-11-78	40.70 / 311.32	43.90 / 311.78	11^{15} A 35.14 / 311.18		
11-19-78					see note 48'0" / 309.3
1-30-81		3^{00} PM 47.27 / 308.41	10^{15} 44.05 / 302.27		
9-10-81		2^{20} PM 50.42 / 305.26	46.74 / 299.58		
9-11-81					3^{31} 60.40 / 296.93

Remarks:

① M.P. not known but assuming Ground surface

② recovering

No. of remark

Sample: level | time

AR000214

Observation Wells
During Pumping Tests

Pumping Well Phila Sub Great Valley Well

Project:

Observation Well	#11 Phila Sub		#12 Sitewell		#13		#14 Bernardin		#15 McDanister	
Description of Meas. Pt.	lip of 8" casing		lip of 6" casing				lip of well pit 1.67			
Date										
1-74								70' ①		
11-19-77	PM	855 / 323.69								
11-26-77			11 AM	30.93 / 307.8		- / -	11:25 AM	83.62 / 314.02		- / -
1-							11:2	315.06		
1-10								322.11		
2-	IP	1.75 / 330.49								
11-11-78			10:30 A	27.31 / 311.32					10:55	5.10
1-30-81			2:35 P	36.25 / 302.38						
9-10-81				38.96 / 299.67						

Remarks:

① Keyes put in new pump - approx level

No. of remark

Sample: level

AR000215

Observation Wells
During Pumping Tests

Pumping Well Phila. Sub Great Valley Well

Project:

Observation Well	#16 Mc Laughlin	#17 Tansey		#18 Beaver (old)		#19 Beaver (new)		#20 Hoopes (new)	
Description of Meas. Pt.		lip of cement block		top of flagstone		lip of 6" casing		lip of 6" casing	
Date		[illegible]		[illegible]		361.85		[illegible]	
Dec 1954			40' ①						
11-26-77	- -	pm	37.63' / 311.52	pm	51.17 / 311.59	pm	50.31 / 311.54	pm	41.69' / 312.27
1-5-78		[illegible]	/ 315.89	3:20 P	[illegible] / 316.34				
1-12-78				[illegible]	[illegible] / 317.46				
11-11-78		1020A	37.78 / 311.37	1005	51.14 / 311.32	1000A	50.47 / 311.38	950A	42.00 / 311.96
1-30-81		220	46.62 / 302.53						
1-31-81								106	51.02 / 302.94
9-10-81						237	61.95 / 299.90	232	53.57 / 300.39

Remarks:

① level when Tom Keyes drills well

no. of remark

Sample: level | time

AR000216

Observation Wells
During Pumping Tests

Pumping Well ____________

Project:

Observation Well	#21 Hoopes - pool		#22 Hoopes - old well		#23 McDonald		#24 Lewis		#25 Liberty Mutual Spring	
Description of Meas. Pt.	lip of well seal at G.S.		lip of well pit floor surface		lip of casing (in well pit)		lip of conc dug well		Top [illegible]	
Date	[illegible]6.73		[illegible]		352.17 well		[illegible]		mark [illegible].05	
8-30-64		40' ①	casing 354.13		352.06 [illegible] / 355.66 well pit					
11-26-77	pm	44.88 / 312.05	pm	46.38 / 312.32	pm	34.75 / 317.53	pm	7.92 / 291.97		
12-15-77									3[50] pm	.20' / 285.85
[illegible]	[illegible]	[illegible] / 321.24	[illegible] p	[illegible] / 312.50 ②			12[illegible]	[illegible] / 292.18		
[illegible]		48 / 324.45		[illegible].77 / 320.93						
[illegible]									[illegible] P	1.20 / 284.85 ③
11-11-78	9[55] A	44.75 / 312.18	9[48] A	42.06 / 312.07	9[40] A	35.67 / 316.51 ④				
10-17-80					10[00] A	40.22 / 311.95				
1-31-81	1[03] pm	53.78 / 303.15								
1-30-81					12[45]	46.67 / 308.99 5				
9-10-81	2[30]	56.05 / 300.88			1[20]	52.0 / 303.66 5				

29

Remarks:

① Level when drilled - Trego bill

② this is hard to believe the elev.

③ this doesn't seem to be - same reference as one previously

④ lip of hole .11' below casing

⑤ to top of well pit
diff. between 5 & 4 = 3.60'

No. of remark

Sample: level [illegible]

AR000217

Observation Wells
During Pumping Tests

Pumping Well _____

Project: 91

Observation Well	26 Kaye		27		28		29		30 ② Sandmatt
Description of Meas. Pt.									[illegible] 310.4 [illegible] 303.92
Date When drilled	8/54	~70'	9/59	~65'	10/61	~50'	3/65	~100'	top of well casing 6.21 below surface
12-5-77									4:40 pm 7.27' / 294.68
1-5-78									1pm 5.70' / 298.25 ①

Remarks:
① same measuring point as one above
② See calendar on 10-29-77 21' or 289.4

No. of remark

Sample: level | time

Observation Wells
During Pumping Tests

Pumping Well Great Valley

Project: Hillbrook Circle

Observation Well	31 McLucas	32 Miller	33 Watson old well	34 Phila New Park	35 ~~Spring House~~
Description of Meas. Pt.	lip of well pit metal 355.44	bar across lip of well pit @ G.S.		lip of manhole ~365	Top Step 325.17
Date					
12-14-77	4^50 pm 40.00' / 315.44	5^10 pm 52.75'			
4-26-78				1 pm 58.95 / 306.05	
11-11-78	11^47 A 41.57 / 313.87				
1-30-81	2^50 50.25 / 305.19				
9-16-81			11° Am 47.87		
9-11-81	2^00 pm 53.03 / 302.41				

Remarks:

Sample: level / time — No. of remark

AR000219

WATER LEVELS IN MONITORING WELLS

Project

Pumping Well:

Monitoring Well	36 Calloway		37		38		39		40	
Description of Meas. Pt.	top of 6" casing									
G.S.-M.P.										
Elevation MP	344.66									
Distance to										
DATE										
11-11-78	1120 A	33.51								
		311.15								
1-30-81	1045	37.58								
		307.08								
9-10-81	1100	46.00								
		299.66								

Remarks:

No. of remark

CLOCK	LEVEL
ET	ELEV

Sample:

AR000220

WATER LEVELS IN MONITORING WELLS

Project
Pumping Well:

Monitoring Well	41		42		43		44		45	
Description of Meas. Pt.										
G.S.-M.P.										
Elevation MP										
Distance to										
DATE	1105	44.93								
8-30-81										
9-10-81		47.58								

Remarks:

AR000221

No. of remark

Sample:	CLOCK	LEVEL
	ET	

WATER LEVELS IN MONITORING WELLS

Project
Pumping Well:

Monitoring Well	Lopez 65		Cassing- 66		Macario 67		Raffertz (new Well) 68		
Description of Meas. Pt.	Top of Casing		Top of 6" casing				Top of Casing		
G.S.-M.P.	.8		.75				0.0		
Elevation MP	368.98		325.75				330.03		
Distance to									
DATE		60.24	845	46.09					1
10-17-80		308.74		279.66					
9-10-81	1 ft	68.73							
		300.25							

Remarks: ① owner told me - didn't want measured
② " " " "

No. of remark

CLOCK	LEVEL

AR000222

Sample

Appendix D

Monitoring Well Drawdown and Yield Data

Measureing Point:

Pumping Test - water Level Data

Well CC-2 pump sampling 5-7-81

Date	Time watch	Time mins.	Marker (ft)	Depth to Water (ft)	Drawdown (ft)		Pumping Rate	Remarks	Initials
5-7-81	1055			69.02'				static before setting pump	
		0		67.85				static after setting pump	
		1.5		72.8				initial Q greater - cut back	
		7		71.2					
		9		71.04					
		13		70.94			1.33 gpm	cloudy/turbid water	
		15.5		70.13					
		16						increased flow	
		17.3		74.15					
		18.5		75.52					
		21		76.72			6.7 gpm	1 gal/9 secs	
		24.25		77.26					
		25		77.27				cloudy turbid tan brown some grit in discharge	
		28		77.34					
		33.5		77.46				increased sediment in discharge	
		36		77.46					
		38						Q cut back - variable flow hard to control as sediment clogs valve	
		45					open 9 gpm	open Q	
		54		78.51					
		57.5		79.80					
		60		79.10					
		0.5		77.3				Recovery	
		1		75.75					
		2		74.12					
		3		72.87					
		4		71.96					
		5		71.28					
		6		70.84					
		7		70.48					
		8		70.16					
		9		69.92					
		10		69.7					
		13		69.33					
		14		69.18					
		16		69.02					
		17		68.95				Samples taken at 10, 20 & 60 minutes of pumping	
								60 minute sent to lab	

Measureing Point:

Pumping Test - water Level Data

CC #3
Pumping for Sampling
5-8-81

Date	Time watch	Time mins.	Marker (ft)	Depth to Water (ft)	Drawdown (ft)		Pumping Rate	Remarks	Initials
	10⁰⁰A			77.50'				static	
		0							
		3.5		79.7					
		5.5						open discharge	
		.5		84.95			~1 gpm		
		1.5		86.1					
		2		86.67					
		2.5		87.73					
		3.		88.3				very muddy	
		3.5		88.4					
		4							
		4.5		88.69					
		5		89.25					
		5.5		~~88.73~~					
		6		89.78					
		6.5							
		7	13 min	90.47					
		14.5						back out slotted pumped & cut back discharge	
		15.						turned pump off	
		16.5		84.37					
		17		83.00					
		17.5		92.12					
		18		81.62					
		19		80.67					
		20		80.14					
		21		79.78					
		22		79.45					
		24		79.18					
		25					2½ gal/min	pump on very muddy	
		33		sample					
		30		81.9			~1.75 gpm	discharge lower	
		31		81.86				" upped	
		34.5		81.78			2.5 gpm		
		36.5		82.13					
		40		81.75					
		45		81.33			~1.8 gpm		
								trying to keep flow ~ 2½ gpm	
		50		82.51					
		54		83.18					

Well CC-5
pump sampling
5-7-81

Measureing Point:

Pumping Test - water Level Data

Date	Time watch	Time mins.	Marker (ft)	Depth to Water (ft)	Drawdown (ft)		Pumping Rate	Remarks	Initials
5-7-81	2:15p			60.32				static before setting pump	
		1		60.18			1 gpm	clear	
		1.5		60.32					
		2.5		60.19				see field notes yellow pad.	
		3.5		60.33					
		5		60.31					
		6		60.32					
		7						increased Q	
		8		60.34					
		8.5		60.35					
		10.5		60.35			3 gpm		
		11.5		60.35				clear	
		12		60.36					
								generator cut off	
								Restart	
		0		60.30					
		.5		60.46					
		1		60.44					
		1.5		60.5			10 gpm		
		2		60.43			6 gpm		
		4		60.50			10 gpm		
		5		60.50					
		6		60.50					
		7		60.52					
		8		60.52					
		9							
		9.5		60.52					
		11		60.53					
		13		60.53					
		15		60.53					
		17		60.53					
		19		60.53					
		20						off	
		.5		60.34				Recovery	
		1		60.35					
		1.5		-					
		2		-				samples taken at 10, 20 and 30 minutes 30 minutes sent to lab.	

AR000226

APPENDIX B

Addendum I
GROUNDWATER QUALITY INVESTIGATION
FOR CHEMCLENE CORPORATION
MALVERN, PENNSYLVANIA

Work Plan for Clean-Up and Future Monitoring (September 1982)

Addendum I

GROUNDWATER QUALITY INVESTIGATION
FOR
CHEMCLENE CORPORATION
MALVERN, PENNSYLVANIA

Work Plan for Clean-up
and
Future Monitoring

September 1982

Prepared for the

CHEMCLENE CORPORATION
258 N. Phoenixville Pike
Malvern, Pennsylvania 19355

Prepared by

MOORSHEAD-SIDDIQUI AND ASSOCIATES
Environmental Consultants

605 S. Talbot Street
St. Michaels, Maryland 21663
301-745-5046

and

104 E. Market Street
West Chester, Pennsylvania 19380
215-436-4773

INTRODUCTION

Chemclene Corporation has continued to make progress in the clean-up of contaminated soils and ground water at two locations on their plant property. These locations have been previously identified as the plant area and former disposal area (see Figure 1).

As a result of agreements reached May 25, 1982, between Chemclene Corporation and Pennsylvania's Department of Environmental Resources (DER), specific clean-up efforts at the two locations were outlined. These efforts included: disposal area evacuation, on-going groundwater sampling and groundwater recovery and treatment. In order to clarify and document clean-up efforts DER has requested that a submission addressing the following activities be forwarded to the Department. The submission should specifically include the following:

1. Disposal Area Evacuation:

   The submission must present a detailed program and schedule for disposal of wastes contained in the open pit, covered pit and berm area of the site. The program must address drum sampling protocol and waste handling, transportation and disposal methods. Sampling and subsequent removal of contaminated soils associated with the three disposal areas, as well as a 10 foot by 10 foot area of contaminated soil at the former drum storage area by the plant, must be addressed. In addition, the submission must address how surface water run-on and run-off will be controlled at the disposal areas.

LOCATION MAPS
FIGURE 1

Well Clemclene Project

Project: Clemclene

State: Pennsylvania

County: Chester

~~Town~~/Township: East Whiteland

Street: Phoenixville Pike

Tract: —

Topographic setting: valley & side hill

Physiographic province: Piedmont

Geologic formation: see text

Longitude: —

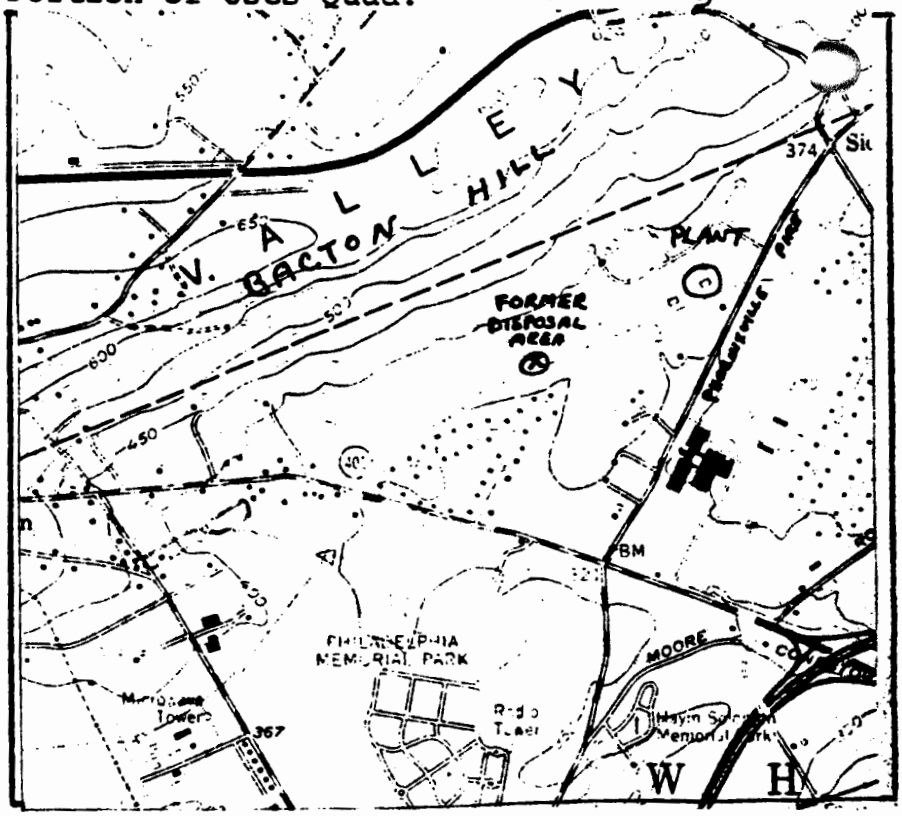
Latitude: —

Elevation at surface: 300'-400'

Flood elevation: none

Flood potential: none

Portion of USGS Quad: Malvern 7½



Date:

Scale: 1=2000'
Contour Int 50'

Locations also plotted:

Access problems:

none

Site plan prepared by:
T. Moorehead

Identified on plot plan:

✓wells ✓roads
✓springs property l'ns
✓pipelines electric l'ns
✓surface water bodies

Site/Well identified by:

casing

Completed by: T. Moorehead
Date: 9/81

SITE PLAN

see airphotos
and 1" = 400' line
drawings.

Date:

Scale:

In any case, the Department anticipates the removal of all wastes from all three disposal areas by the end of 1983.

2. On-going Groundwater Sampling:

The submission must provide for continuing quarterly groundwater sampling until completion of all clean-up activities. Approximately 4 to 6 on-site wells should be incorporated into a quarterly monitoring system. In addition, a well sampling program should be established involving adjacent private wells to insure that previous uncontaminated supplies have not become contaminated. It is the Department's understanding that complete VOA scans will be done on wells "CC3" and "CC5", and that future quarterly analyses will be confined to parameters found in the scans. It is also our understanding that an initial composite of all 4 to 6 monitoring wells will be analyzed for PCB's.

3. Groundwater Recovery and Treatment:

The submission must provide additional information and justification for the proposed groundwater treatment system. Such information is to include:

a. Number and location of recovery wells.

b. Pumping rates at each well.

c. Treatment and final disposition of water pumped. If various techniques are to be evaluated, the trial procedures and periods should be specified and should lead to the selection of a preferred technique.

d. Needs for DER Water Quality or DRBC permits must be addressed.

To address the above issues in detail Moorshead-Siddiqui and Associates with the cooperation of the Chemclene Corporation has prepared the following work plan:

CLEAN-UP AT THE FORMER DISPOSAL AREA AND PLANT

Open Pit

It is anticipated that the open pit will be evacuated by December 31, 1982. This assumes a fair amount of good

weather and successful solidification on-site. This time frame applies to the berm area to the west of the former disposal area. Based on the data gathered by Betz, Converse, Murdoch, Inc., we can conclude that there are no polychlorinated biphenol (PCB) contaminated materials in the open pit; and therefore, we will be handling all that material by the same solidification process (described under - Plan for Solidification). Once solidified, the material will be transported by a licensed transporter to an approved landfill outside the State of Pennsylvania.

After enough soil has been exposed in the pit, samples will be taken of the soil to determine the extent of contamination and therefore the disposal options. If the soil contains low enough levels it will be disposed of, with Department of Environmental Resources (DER) approval, at the Boyertown landfill. If the contamination level is too high for that landfill, the soil will be used, along with lime kiln dust, to solidify additional material taken from the pit.

After all drums and loose refuse have been removed from the pit, and the most highly contaminated soil has been removed via one of the aforementioned methods, a decision point may have to be reached where pumping well #CC-5 may be more practical and effective than removing more soil. This will be discussed further with DER when that time approaches and will be dependant on contamination levels found in the soil.

<u>Berm Area</u>

It is anticipated that this area will be cleaned up

in conjunction with the open pit. From preliminary investigations, it appears that the material in these drums is now in a solid state and will therefore be added to the mixing box with material from the open pit.

Once the drums are removed, the underlying soil will be sampled and handled as previously discussed.

Closed Pit

This area represents considerable difficulty in that we know that there is PCB material present, at least in some portions of the pit. We plan to isolate those areas by evacuating according to a grid system. Samples of soil and drum contents from each section of the grid will be analyzed for PCBs. If the analysis is positive for PCBs, material from that section of the grid will be dealt with as a special and separate entity. Solidification will be used prior to shipment. PCB material will be disposed of at either Cecos in New York, Chemical Waste Management in Alabama or Rollins in Deer Park, Texas, depending on the concentrations of PCBs in the particular separate lot. Other permitted sites will also be be considered. Non-PCB material will be handled and disposed of as previously discussed. Of necessity, this portion of the clean-up plan will depend on what is found when the pit is opened.

The plan may need to be modified to include untilizing an outside contractor once the sampling begins. Any changes in the plan will be reviewed with DER.

Contaminated soil around and under the closed pit will be dealt with as previously discussed.

Water run-on and run-off is a problem only with the closed pit. The open pit is protected from run-on by an up-gradient hill of dirt; we have never experienced any surface water run-off from the pit. An earthen dike has been constructed on the down-gradient side of the closed pit. The heaviest rains experienced to date have not over-run this barrier. It is planned to construct a similar barrier on the up-gradient side of the pit. Construction of the barrier should be completed by September 1, 1982.

Former Drum Storage Area at the Plant

One of these two areas has already been removed, and data concerning the soil has been sent to the Boyerstown Landfill with instructions to contact DER for disposal approval. The remaining area (adjacent to the concrete slab that was a drum storage area on the northwest side of the plant) will be added to the soil already removed from the first area and will be disposed of as soon as the landfill receives DER approval.

Solidification Plan

Solidification will be by a method similar to that used by Delaware Container Co., Inc. of Coatesville, Pennsylvania. A drum will be removed from the pit using a sling attached to the arm of a backhoe. The drum will be placed on a work platform next to a mixing box. The drum will be deheaded using an air powered chisel and the contents dumped into the mixing box which will be constructed of welded steel. Lime kiln dust will be added to the waste material

in the box and mixed until there are no free liquids and the mixture is of the proper consistency for hardening. When the box is full, the contents will be transferred to a dump trailer for transport to the disposal site.

ON-GOING GROUNDWATER SAMPLING

Chemclene Monitoring Wells

Wells CC-2, CC-3, CC-5 and Well #10 are designated as on-site monitoring wells and will be sampled quarterly as part of an overall sampling effort (see Figure 2 for locations). Samples will be collected using appropriate methods and will be analyzedfor TCE at an approved laboratory. Results will be submitted to DER as soon as they are obtained.

VOA scans completed previously indicate that TCE is the primary volatile organic compound found in the ground water under the site and should serve as an excellent tracer. For this reason additional VOC scans determining the concentrations of other constituents which might be present in even lesser amounts than TCE is not anticipated.

Samples from Well #10 and CC-5 have been checked for PCBs with negative results. Further testing of other wells does not appear to be justified in view of these results.

Private Wells

In order to determine the long-term trends in TCE concentration in adjacent private wells, 6 off-site domestic wells have been selected for sampling. These include:

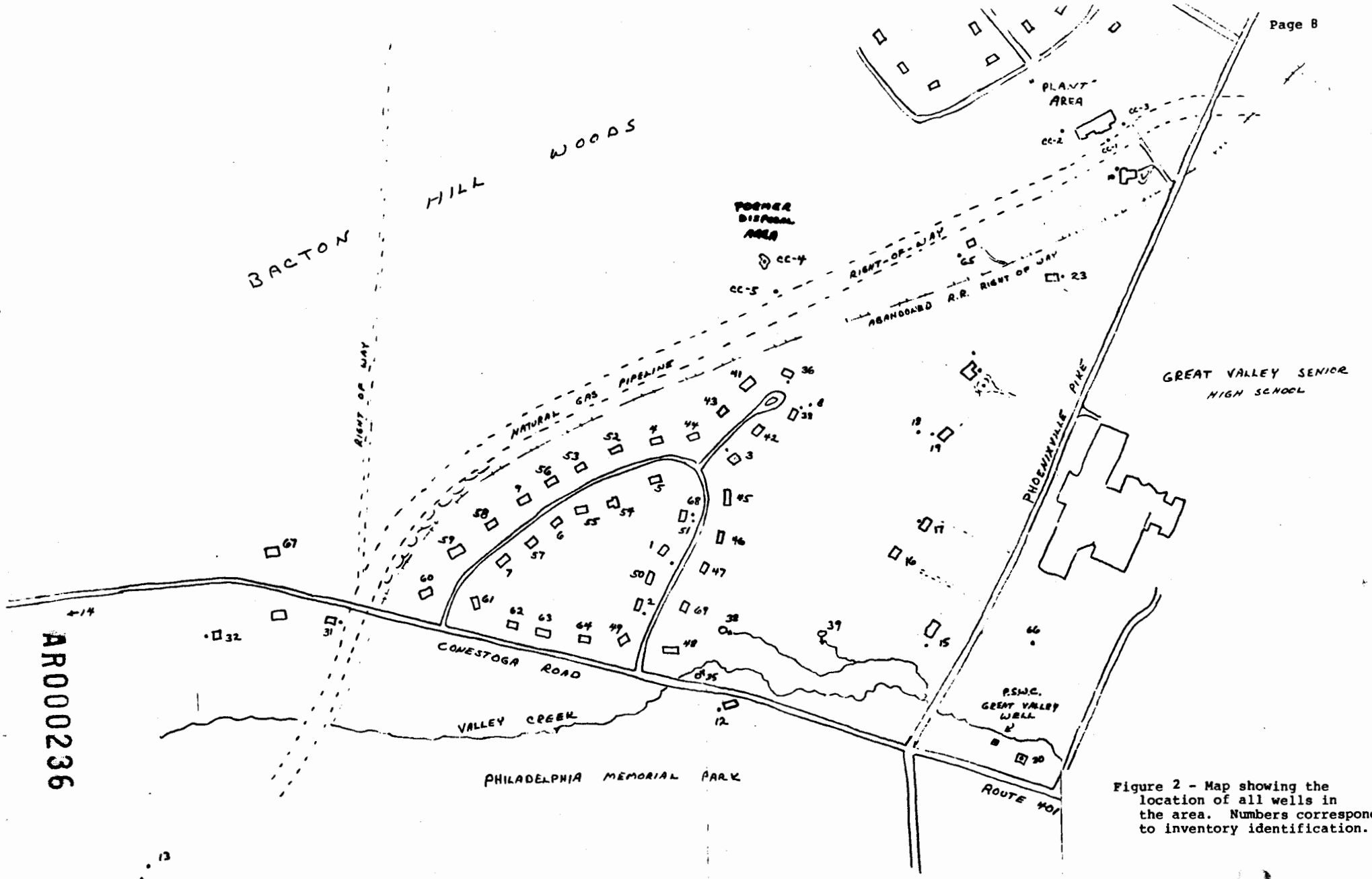


Figure 2 - Map showing the location of all wells in the area. Numbers correspond to inventory identification.

Area A - Wells #15, 23 and 65

Area B - Wells #5 and 41

Area C - Well #9

The selection of these wells is based on their location in specific areas identified previously (see March 1982 report). These wells should provide a basis for determining concentration trends in each specific area as clean-up proceeds. Samples will be collected quarterly along with the on-site samples. Sample protocol and reporting will be the same.

As data becomes available and trends are established, the sampling routine may be modified accordingly. The sampling routine will be modified, however, only with DER approval.

GROUNDWATER RECOVERY AND TREATMENT

Present Recovery

A groundwater recovery plan has already been submitted to Ms. Marylyn Shup of DER on July 1, 1982. Implementation of the plan will commence as soon as necessary approvals are obtained. Well #CC-3 was chosen for recovery purposes both because it showed the highest levels of contamination and because of its proximity to the plant where the process can be more closely managed. Chemclene Corporation anticipates that the method outlined in their July 1, 1982, letter will be successful and have therefore not included other possible techniques. Should the method not completely remove contaminants as described, modifications such as introducing air into the line will be utilized.

Future Recovery

There are only two other wells (CC-1 and CC-2) at present which might lend themselves to groundwater recovery. It is not anticipated that these wells will be used at this time. If the pumping of #CC-3 does not produce the desired effect then using either of these wells or constructing a new well may be considered.

Permits

The necessary permit for on-stie treatment has been requested from DER. The Delaware River Basin Commission (DRBC) does not require a permit if pumping is less than 10,000 gallons per day.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

SUBJECT: Chemclene Corporation - Malvern, PA

DATE: 9/3/87

FROM: GK
Greg Koltonuk
PA RCRA Enforcement Section (3HW11)

TO: File

At 4:00 p.m. on Monday, August 24, 1987, I received a telephone call from Lloyd Balderston, present owner of Chemclene Corporation. His call was in response to my call to Earth Data, Inc. concerning the spray irrigation system at Chemclene. This system was last used in 1984 by the company to recover and treat contaminated groundwater at the site. The system consisted of a sprinkler head attached to a hose from the groundwater recovery well. He also described to me the method of sample collection prior to and after treatment.

Chemclene has since installed an air-stripper but the system has not been used to date. This air stripper consists of an 18' tall, 12" diameter pipe filled with nylon rings.

I mentioned to Mr. Balderston the deletion of Chemclene's T04 Code for treatment. He admits that some designation should be on the present Part A that covers his solvent recovery system but, to date, this system, (i.e., treatment) is not designated on the Part A. DGR does not consider C.C. to perform any "treatment" operations. According to Balderston the Chemclene operations are listed as storage of drum materials.

COMMONWEALTH OF PENNSYLVANIA
STD-502 REV. 4-83

DESK MEMORANDUM

SUBJECT: ChemClene - East Whiteland Twp. Chester Co.

TO: Joe Kotlinski

FROM: Bob Bauer

DATE SENT: 6/28/88

DATE NEEDED:

	PLEASE CALL:		APPROVAL		SEE ME
	RETURNED YOUR CALL		AS REQUESTED		COMMENT
✓	INFORMATION & FILE		PREPARE REPLY/REPORT		NOTE AND RETURN
	NECESSARY ACTION		SIGNATURE		

RECEIVED BY | DATE | TIME

ROUTE	INITIAL	DATE	ROUTE	INITIAL	DATE

MESSAGE:

Mr Kotlinski,

Attached, is a copy of soil analysis conducted from the sample collected during the recent removal of an UST (gasoline) at the above referenced site. This may be of interest to you since you are currently taking enforcement actions at this site. If you have need for any additional info, please feel free to contact me at 215 270 1975

RJB

AR000240

ERC 7/8

2

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF LABORATORIES
SPECIAL ANALYSES REPORT

Lab Number 00-3613
Date Received 5/6/88

ESTABLISHMENT	CASE	FACILITY	COLL NUMBER
ChemClene	45T Excavation		

COUNTY	MUNICIPALITY	PROGRAM	COLL NAME/PHONE NUMBER	TYPE TR	STD ANALYSIS
Chester	E Whiteland	106	Bauer 270 1975		

CARD (3)	ID CODE (ALL CARDS) 4–16						LATITUDE 4–10	LONGITUDE 11–18	DATE 19–24			TIME 25–28		KIND 29
1/2	Cnty	Mun	T	Est	Case	Fac.		0	M	D	Y	Hr	Min	
									05	05	88	09	00	

USGS Q 30 34	BUREAU 35–37 AMIS	SAMPLE NUMBER 38–43	STREAM NAME 44–57	RELATIVE POINT 58
	701	011U439	SO1	

FULL DESCRIPTION WHERE SAMPLE TAKEN:

ADDITIONAL LAB ANALYSES
GC/MS
Note: Waste Solvent Recovery Site

CUSTODY LOG
How Shipped Purolator Date 5/5/88
Legal Seal No. 200641
Received by:
Legal Seal Condition: good DAB 5/6/88

QUALITATIVE REPORT

DO NOT WRITE BELOW THIS LINE

GC/MS also detected Tetrachloroethylene & Also various isomers of Cumene estimated to be between 30000 and 8000. ug/kg. GC/MS Also detected Large number of Alkanes

QUANTITATIVE RESULTS

ANALYSIS:	UNITS:	ANALYSIS CODE	RESULTS (SHOW DECIMAL POINTS ON LINES)
Xylene	ug/kg		4000.
Naphthalene			400.
2-Methyl Naphthalene			100.
~~Phenanthrene~~ 1-Methyl Naphthalene			100.
Phenanthrene			200.

ANALYST Lori A. Clemens SIGNATURE DATE 6/8/88

AR000241